

PLANT AND ANIMAL REMAINS
OF THE
COMMISSIONERS
OF THE
STATE RESERVATION AT KETCHIKAN
OCT. 1, 1897 - SEPT. 30, 1898

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EIGHTH ANNUAL REPORT

OF THE

COMMISSIONERS

OF THE

STATE RESERVATION AT NIAGARA

FOR THE FISCAL YEAR,

From October 1, 1890, to September 30, 1891.

TRANSMITTED TO THE LEGISLATURE JANUARY 29, 1892.

181994

ALBANY:
JAMES B. LYON, STATE PRINTER.
1892.

COMMISSIONERS.

ANDREW H. GREEN, *President.*

JAMES MOONEY.

JOHN M. BOWERS.

JOHN HODGE.

DANIEL BATCHELOR.

TREASURER AND SECRETARY.

HENRY E. GREGORY.

SUPERINTENDENT.

THOMAS V. WELCH.

STATE OF NEW YORK.

No. 46.

IN ASSEMBLY,

JANUARY 29, 1892.

EIGHTH ANNUAL REPORT

OF THE

Commissioners of the State Reservation at
Niagara for the Year 1891.

To the Honorable the Legislature of the State of New York:

The Commissioners of the State Reservation at Niagara, as required by law, submit their report for the fiscal year begun October 1, 1890, and ended September 30, 1891, being their eighth annual report.

The Reservation has been visited during the year by a larger number of persons than during any year since the State acquired the property. There has consequently been an increase in the amount of the receipts. The inclined railway yields the principal part of the annual revenue, and the excess of income from this source over that of the preceding year was \$1,622.50.

The fact that admission to the Reservation is free to everybody has proved an attraction to many who, had the tolls, charges and exactions that formerly existed been retained, might have remained away. That these hin-

drances to a free access to the territory adjacent to Niagara Falls so long existed will seem more than ever preposterous as time goes on and the advantages which the people now enjoy become better known.

The commissioners are justified in assuming that there will be no diminution of popular interest in Niagara, but, on the contrary, that, as the assurance of immunity from vexatious charges becomes more general, the number of visitors to the Reservation will constantly increase. They anticipate that the attendance next year will be considerably greater; while during the continuance of the Columbian exposition at Chicago in 1893, the number of visitors will naturally be exceptionally large. The World's fair will give an impetus to travel not only among our own people, but will draw thousands from Europe and other parts of the world. No one, it may be said, who comes from abroad to visit the exposition at Chicago will fail to see Niagara.

It is important, therefore, that the Legislature provide means for putting the Reservation in a condition that will be creditable to the State and produce a favorable impression upon tourists.

And first, the commissioners would inform the Legislature as they have done in previous reports, that the roads and walks of the Reservation need reconstruction. Road improvement at this time most imperatively demands attention.

Thousands of visitors to Niagara are necessarily much inconvenienced in their sight-seeing by the difficulties they meet with in going from place to place on the Reservation. The Goat Island roads in particular have been described as "a disgrace to the State." They are exposed at certain points to the spray from the falls which, settling upon them, keeps them drenched for days and even weeks.



They are in parts so thickly shaded that mud remains upon them, deep and black, long after the rain has ceased, to the obstruction of vehicles and the discomfort of visitors.

There would seem to rest upon the Legislature a recognizable obligation to keep the State's property at Niagara in a presentable and attractive condition. All the points of interest within the Reservation should be easily and agreeably accessible. Good roads and walks are indispensable, and there should be no further delay in providing for them.

The commissioners feel that in thus again bringing to the attention of the Legislature this matter of the reconstruction of roads and walks on the Reservation, they are advocating an improvement that will be highly appreciated not only by tourists, but by residents of the villages and towns in the vicinity, and one that will eventually be of great importance to the people of the State.

The Reservation at Niagara is the property of the State. It includes within its boundaries the greatest and most celebrated cataract known to the civilized world, the one natural object on this continent that attracts visitors from the remotest parts of the country, as well as tourists from the most distant lands. Surely here, if anywhere, the State might appropriately inaugurate and carry out the beneficent policy of road-improvement.

Properly constructed roads and walks on the Reservation would increase the comfort and satisfaction of a visit to Niagara and complete the favorable impression that visitors so generally carry away with them. But they would do more than this. They would be, as it has been said, "object-lessons" "stimulating local authorities to the improvement of other highways by presenting examples of substantial construction, and by illustrating

the material advantages which accompany ready and satisfactory means of communication."

The one thing that principally prevents a visit to Niagara from being entirely delightful is the condition of the roads and walks. Language, now as ever, is inadequate to give expression to the sensations of pleasure, admiration, wonder and awe, as one looks upon the Cataract. The Rapids have a perpetual and mysterious fascination from whatever point regarded. The sylvan scenery of Goat Island is surpassingly beautiful. The view from the river bank towards Port Day across the wide, smooth, slow-moving stream to the Canadian shore is full of peaceful charm and in decided contrast to the stupendous spectacle a short distance below. But the roads and paths along which the visitor must go in order to gaze upon these beauties and wonders of natural scenery are nowhere what they should be. It is much to be regretted that such interferences with the pleasure and satisfaction and edification of a sojourn at Niagara should be permitted to exist. The roads of the Queen Victoria Niagara Falls Park in Canada are admittedly superior to those of the Reservation. Our own roads should not be in such a condition as to excite an unfavorable comparison with those of the Ontario Park.

It is to be hoped that before many years a broad highway of the best construction will stretch from Buffalo along the river to Niagara. The natural continuation of such a highway would be northwardly from the Reservation along the bluff of the river to the bend at the whirlpool and thence onward to Lake Ontario. If the construction of such a road is impracticable at this time, on account of the value of improved property along the bluff in the villages of Niagara Falls and Suspension Bridge, there would be noth-

ing impracticable in the deflection of the line of such a road back from the bluff through the village of Suspension Bridge down to the whirlpool. A survey of the locality has been made under the direction of the State Engineer and Surveyor, the Hon. John Bogart, and the commissioners are informed that no natural obstacles would prevent the construction of such a roadway. Nor would there be any difficulty in connecting the New York bluff with that of Canada by a bridge just below the whirlpool. "In the vicinity of the whirlpool," said the Assistant State Engineer, who made the survey, "the cliffs and talus are of the same nature as those upon which the Cantilever and old Suspension bridges rest, about one mile up stream, and conditions obtaining there would hold good here."

Whether such a road and bridge shall be constructed depends upon the disposition of the Legislature.

By chapter 302, Laws of 1891, the Legislature appropriated the sum of \$15,000 "for the construction of roads, walks and other improvements on the Reservation;" and the State Engineer and Surveyor was "authorized to make such surveys and maps of the territory along the Niagara river, within the Reservation, as may be required of him by the commissioners."

Under the authority thus conferred and in compliance with the request of the commissioners, the State Engineer and Surveyor deputed one of his assistants to undertake the surveying work necessary for laying out a road on Goat Island. A careful topographical survey, showing the location of large trees and important points along the line of the proposed road, has been made.

In determining the line of the road, the requirements of the public have been considered, as well as the importance of avoiding serious injury to the Goat Island forest and the destruction of large trees. It has been deemed advisable

to keep the road within convenient proximity to the margin of the island, so that views of the cataracts and the river may be as unobstructed as possible. Especial care has also been taken that there shall be no interference with the comfort and satisfaction of those large numbers of persons who visit the Reservation on foot.

The road is to be sixteen feet in width, with rubble stone foundation course, broken stone intermediate course and gravel surfacing. The walks are to have a rubble stone foundation and gravel surface.

The commissioners in determining the route of the road and walks have sought the professional advice of Mr. Samuel Parsons, Jr., the landscape architect to the board, and of Messrs. Vaux & Co., as well as that of the Hon. John Bogart, State Engineer and Surveyor.

It should be said that the \$15,000 appropriated by chapter 302, Laws of 1891, will be insufficient to complete the proposed roads on the Reservation; but the commissioners are confident that the Legislature, after having considered the statements hereinbefore made, will grant them an amount adequate for the completion of the road work they have undertaken. They respectfully represent that the sum of \$25,000 is needed.

Nor should provision for walks and foot-paths be neglected. Pedestrians are more numerous than those who drive in carriages, and their convenience should primarily be considered. The genuine lover of nature needs no inducement, except proper paths, to prefer walking on the Reservation. In no other way can he reach the points of greatest interest and obtain views of rarest beauty and sublimity. There should, of course, be a well-constructed walk around Goat Island, as near as is practicable to the margin, as well as simple foot-paths or by-ways through the woods. The pleasure to be had



during leisurely rambles at Niagara, has been described by a great novelist in the following familiar words:

“To wander to and fro all day and see the cataracts from all points of view; to stand upon the edge of the great Horse-shoe Fall, marking the hurried water gathering strength as it approached the verge, yet seeming, too, to pause before it shot into the gulf below; to gaze from the river’s level up at the torrent as it came streaming down; to climb the neighboring heights and watch it through the trees, and see the wreathing water in the rapids hurrying on to take its fearful plunge; to linger in the shadow of the solemn rocks three miles below; watching the river, as stirred by no visible cause, it heaved and eddied and awoke the echoes, being troubled yet, far down beneath the surface, by its giant leap; to have Niagara before me, lighted by the sun and by the moon, red in the day’s decline, and grey as evening slowly fell upon it; to look upon it every day, and wake up in the night and hear its ceaseless voice; this was enough.”

The commissioners, while emphasizing the necessity of providing for proper roads and walks at Niagara, would not fail to remind the Legislature of the importance of completing as soon as possible the work of restoration. With the completion of the road system, attention should be directed to those portions of the Reservation that suffered particular defacement and mutilation from private owners. This work of restoration is the most important and delicate which the commissioners will have to accomplish. They will secure in the prosecution of it, the assistance of the highest talent in landscape architecture, and, of course, will be compelled to rely upon the co-operation of “the restoring processes of time and nature.”

But first of all, it is essential to awaken the interest and secure the approval of the Legislature, which controls the

disbursement of the public funds. To the people at large, the commissioners can give no promise of a restored Niagara, as long as the Legislature fails to respond to their appeals and ignores their recommendations. It is still to be regretted that the initiative in this work could not have been taken four years ago, immediately after the removal of the buildings and other objects that destroyed the beauty of the landscape. By this time the appearance of the river bank along the Rapids could have been made very attractive and the desired restoration far advanced. No unprejudiced and cultured member of the Legislature, after a visit to the Reservation, would withhold his approval from the simple plan of restoration and improvement which the commissioners desire to carry into effect.

As an indication of the widespread interest in Niagara and of appreciation of the improvements already made, the following extract from a published lecture delivered in Colombo, Ceylon, by the Hon. John Ferguson, a highly respected and cultured citizen of that place, is significant:

“In approaching Niagara, very little intimation is afforded us that we are drawing near one of the world’s greatest sights as we sit in the railway car, until all at once the deep, wide gorge, the grand Suspension bridge, the extraordinary volume of water, and the wonderful rapids burst upon you as you are carried over by the railway to the American side. So far as visitors were concerned, I found in March everything very quiet in a neighborhood that is full of life and animation during the summer season, but I had all the more leisure to watch Niagara from every point of view. My first impression on a close inspection of the falls, as on the first sight of the pyramids below Cairo, twenty-two years previously, was one of disappointment. ‘There is nothing new or marvellous here; all is familiar,

as if I had always known it, from the many representations engraved of the scene.' But the unequalled volume and majesty of the Niagara waters (the name Niagara means 'Thunder of Waters' in the Indian tongue) grow upon you more than any great sight I have ever looked upon. Especially was I struck with the awful deliberateness with which the great flood of water rolls rather than plunges into the gulf beneath. The American Fall is 164 feet high and 900 feet broad; the Canadian Horse-shoe, 150 by 1,900 feet broad. It is calculated that 25,000 tons of water fall at every beat of the pulse, one and one-half million each minute and 100,000,000 tons each hour; and yet the 150,000 square miles drained by this outlet do not miss this enormous quantity of water. (In Colombo about 14,000 tons are supplied in one day.) The muffled thunder of the cataract can be heard a long way off when once the ear is educated to it (at eighteen miles it is readily heard, and in some conditions of the atmosphere, it is said to have been heard at Toronto forty-two miles off). But it was only when I descended by a chain car to a cavern in the side of the river below the fall, and, stepping gingerly along, at last peeped over a parapet immediately in front of the vast boiling caldron which receives the waters, that the full grandeur and sublimity of the scene broke upon me. The noise was deafening, the tints on the spray, green, blue, yellow and white were most exquisite; and the longer I lingered, the more I was awestruck and humbled. I was reminded of lines I had read in coming over the western prairie:

'The vastness of that voiceless plain,
 Its awful solitudes remain
 Thenceforth, for aye, a part of you,
 And you are of the favored few,
 For you have learned your littleness.'

“The effect produced by Niagara is one of awe, and yet tranquillity, inspiring one gradually with great thoughts of eternity and eternal rest even in the presence of the moving waters. The words of Charles Dickens admirably express this feeling :

‘There when I felt how near to my Creator I was standing, the first effect and the enduring one—instant and lasting—of the tremendous spectacle, was peace. Peace of mind, tranquillity, calm recollections of the dead, great thoughts of eternal rest and happiness, nothing of gloom and terror. Niagara was at once stamped upon my heart, as an image of beauty, to remain there, changeless and indelible, until its pulses cease to beat forever.’

“Some years ago there was great annoyance to visitors to Niagara from the absence of authority and order, and the host of pestiferous self-constituted guides, peddlers, etc., etc. The surroundings, too, were unattended to and much harm was being done. Shortly before my visit, however, a movement for the preservation of the scenery of the falls of Niagara originated in the State of New York, an act being passed in 1883, and lately I had the pleasure of seeing the sixth annual report of the commissioners, of whom my friend Mr. Andrew H. Green (brother of the late Dr. Green, of Jaffna), is president. The Reservation opened to the public in July, 1885, comprises a tract of 107 acres, and there is a great variety of arrangements provided for the comfort of visitors. Following suit, on the British side, the Queen Victoria Niagara Falls Park of 154 acres was formed. Every attention and full information are given to visitors, with guides, carriages, etc., at very moderate charges.”

It may not be inappropriate here to refer to the successful attempt made this year by a party of American explorers to reach a cataract of great interest and note-



worthy beauty in the Grand river, Labrador. The expedition was difficult and adventurous; but the party overcame all obstacles and at length reached the Grand Falls, as they are called.

"It was one of those supreme moments which occur only occasionally in a life-time," says an account of the expedition. "The great mass of white foaming water, leaping into an unfathomable abyss from a height twice as great as that of Niagara, made the solid rocks all around tremble, and sent up a vast column of vapor, which mounted hundreds of feet into the atmosphere, being visible at a distance of twenty-five miles. The deep incessant roar, reverberating along the rocky walls of the gorge below, gave an impressive idea of the mighty forces at work within the seething caldron. From the deep pool into which the river hurls itself, the water rushes away in a wild torrent through a narrow chasm, with rocky walls, 300 to 400 feet in height. Striking against the sides of this tortuous channel, which makes frequent turns, and flowing over a rough sloping bottom, the water forms whirlpool rapids, which impinging on the one bank, rush back, eddying and whirling to the opposite side. The appearance below the falls, as far as the eye can reach, is that of a sea in a storm. The length of this narrow chasm through which the river flows below the falls is not less than twenty-five to thirty miles, one of the most remarkable cañons in the world.

"Having feasted their eyes on this grand spectacle, the explorers made their way to the height over the falls. Here they were able to study the formation of the falls, which in several aspects is unique. Going back half a mile from the point where the cataract occurs, they found the river there to be from 400 to

500 yards wide. Then it begins to narrow gradually—the banks approach each other, till, at the falls, the width does not exceed 200 feet. There are three distinct rapids immediately above the falls, which add greatly to the grandeur of the scene. It reminds us of the rapids above the falls of Niagara, though on a far smaller scale, in which for a mile the river rushes along, foaming over a rough bottom. The last of the three rapids preparatory to the final leap, is 188 feet in length, and the angle of the slope thirty degrees. The consequence is that the water driven by the two rapids behind, and compressed into a channel only 200 feet wide, rises into surges, broken and abrupt, and precipitates itself over the rocky edge with great violence.

“By careful measurements the explorers ascertained that the height of the falls is 316 feet. If the three rapids be included, the entire descent would be 500 feet. At Niagara the river makes a descent of fifty-two feet in the mile, before being precipitated into the basin below. On the American side the height is 164 feet; on the Canadian, 150; but the enormous body of water gives Niagara Falls a surpassing grandeur to which nothing else of the kind can be compared, with the exception of the Zambesi Falls, which are only 200 feet in height. At Niagara the large cataract is a third of a mile broad; the smaller 600 feet. It is their great height which gives to the Grand Falls of Labrador their grandeur and impressiveness.”

According to statements recently made, there has been a noticeable sinking of the water level of Lake Erie. When this condition exists, the Niagara river necessarily becomes shallower and the volume of water at the falls diminishes. To the inexperienced eye of the tourist this fact may not

be perceptible; but a fact it nevertheless seems to be. The water in the river has during the past year been exceptionally low. In the lower river there has been a fall of several feet, so that it has at times been difficult for the steamboat "Maid of the Mist" to effect a landing at the dock near the foot of the Inclined Railway building.

The Maid of the Mist Association has petitioned the commissioners for permission to extend its dock, in order that landings may be made at any time. There can be no doubt that this extension is necessary with the river at its present level.

The commissioners are unable to state with any accuracy the cause of the low water. But the commissioners deem it advisable to suggest, that the Legislature scrutinize with great care and even refuse to enact all bills the object of which is the utilization of the water power of the river above the falls for manufacturing and other purposes. The falls themselves being within the limits of the Reservation, are no doubt secure from successful attack; but hardly a session passes without the introduction of one or more bills in the interest of companies organized for the purpose of utilizing the water power of the Niagara river, with the sanction of the Legislature.

The commissioners do not mean to imply that these undertakings are necessarily without merit; but, without reflection on past action, it is undeniable that, if the Legislature shall continue to authorize diversions of the water of the river, the volume at the falls will constantly diminish, and the level of the river both above and below the falls, necessarily sink.

The commissioners look to the Legislature to co-operate with them in their efforts to defend the majesty of Niagara Falls. They are persuaded that, at any rate, public opinion

will sustain them in all endeavors to oppose future undertakings of the character to which reference has been made.

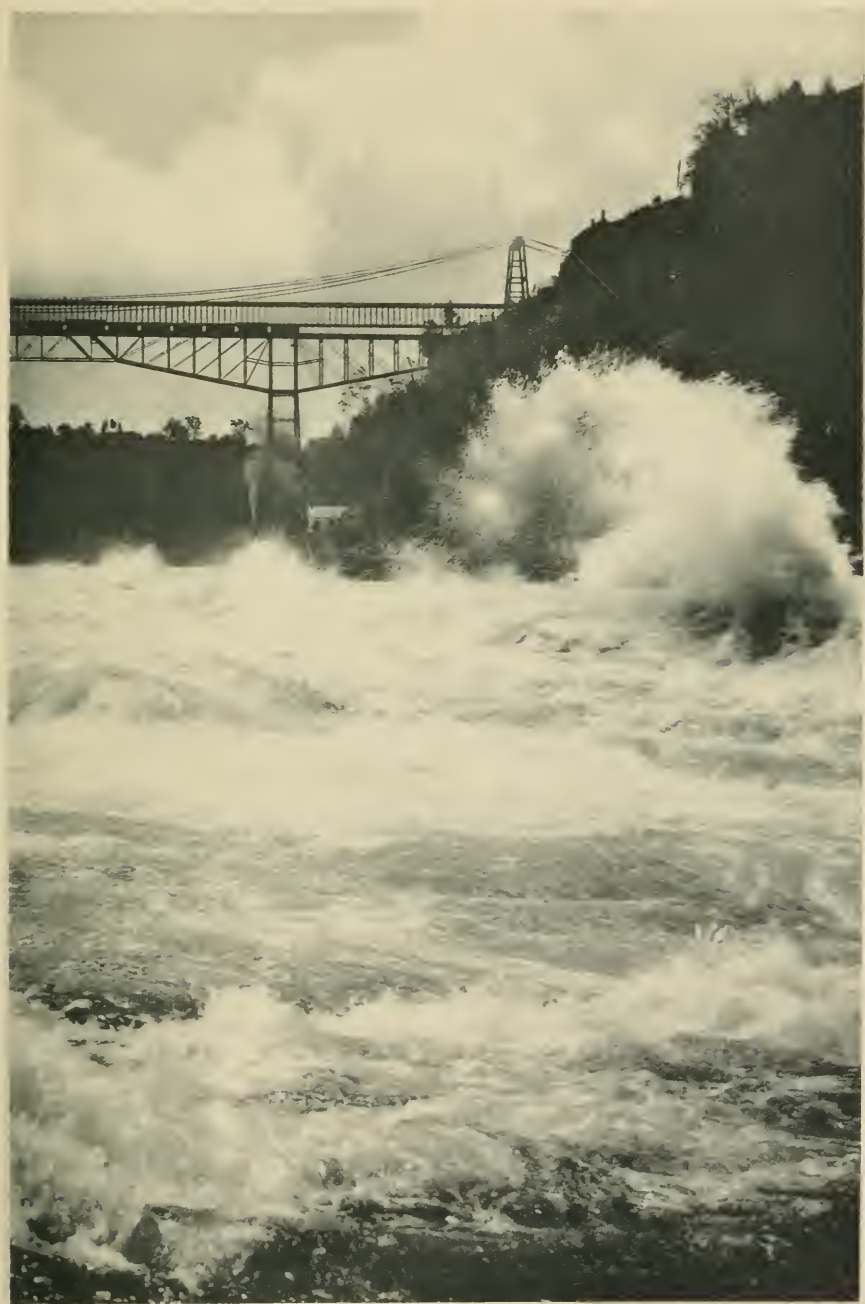
The State as owner of the river bed and the water power should be reluctant to relinquish its right to the same, and should hesitate to sanction any diversion of the water. It would certainly be deplorable should the magnitude and splendor of the world's most wonderful cataract be diminished and its unique beauty marred by business enterprises diverting or fouling the water of the river, with legislative approval.

Even though the Reservation itself be expressly exempt from trespass, and its territory safe from infringement, it can readily be seen how the defilement of the river, or the diversion of its water, even several miles up stream, might seriously affect the natural attractiveness and splendor of the Niagara spectacle and eventually depreciate the value of the State's property.

The Legislature, looking at this question from the point of view of prudent and sagacious business men, and perceiving that the water power at Niagara has an ascertainable pecuniary value, will surely recognize the appropriateness of these suggestions. "The improvident granting of franchises of enormous value, without recompense to the State or municipality from which they proceed, and without proper protection of the public interests, is the most noticeable and flagrant evil of modern legislation."

The crib-work and docking on the southern shore of Goat Island are in good condition, and effectually prevent the wearing away of the soil which had been permitted for so many years.

During the year trees have been planted in the nursery on Goat Island, and at different points on the Reservation. The nursery, it should be said, is not such a one as a



scientific nurseryman would provide, with its properly arranged and carefully prepared soils, but simply a level plot of ground on Goat Island, where young trees adapted to the locality may thrive until they can be transplanted.

The mutilated shore of Goat Island has been restored.

The embankment in River street has been removed.

The iron railing on Goat Island has been extended. Along the stone parapet from Hennepin's View to and including Prospect Point, an iron railing has been placed to prevent accidents at this attractive point.

The approach to the Bath Island bridge has been widened and macadamized. The main bridges have been replanked.

Details of these matters and of the work of the year in general are contained in the annual report of the Superintendent herewith submitted.

The commissioners have received from the State for maintenance, current expenses and salaries, as follows :

By chapter 336, Laws of 1883	\$10,000 00
By chapter 656, Laws of 1887	20,000 00
By chapter 270, Laws of 1888	20,000 00
By chapter 569, Laws of 1889	25,000 00
By chapter 84, Laws of 1890	20,000 00
Total	<u>\$95,000 00</u>

Prior to October, 1887, the receipts from the Reservation were drawn upon to pay the expenses of maintenance. By chapter 656, Laws of 1887, the commissioners were required on the first of October of that year "to pay into the treasury of the State all moneys which may be in their hands as such commissioners," and the same act further provided that they "shall on the first day of each and every month thereafter, pay into the treasury of the State

all receipts and earnings of whatever nature, other than receipts from the State Treasurer." In obedience to this law the commissioners have remitted to the State treasury as follows:

From October 1, 1887, to September 30, 1888.....	\$9,331 55
From October 1, 1888, to September 30, 1889.....	7,393 77
From October 1, 1889, to September 30, 1890.....	7,670 29
From October 1, 1890, to September 30, 1891.....	9,327 67
Total.....	<u>\$33,723 28</u>

Deducting this amount from the \$95,000 which has been appropriated as above set forth, and the balance, \$61,276.72, is what the Reservation has actually cost the State for maintenance during the period from May 29, 1883, to September 30, 1891, the close of the last fiscal year. Or, if we reckon from July 15, 1885, the date when the Reservation was opened to the public, the State has advanced only \$85,000 and has received from the commissioners \$33,723.28; leaving the cost of the Reservation to the State for more than six years at only \$51,276.72, or a little more than \$8,000 a year.

During the year the monthly receipts from the Inclined Railway were as follows:

1890.	
October.....	\$301 05
November.....	81 65
December.....	37 35
1891.	
January.....	50 15
February.....	71 45
March.....	58 45
April.....	77 10
May.....	341 55
June.....	707 00
July.....	1,637 05

1891.

August.	\$2,673 40
September.	1,271 80
Total	<u>\$7,308 00</u>

Receipts from other sources :

Rentals	\$1,840 00
Sales	11 00
Rebate on freight	4 75
Interest	163 92
	<u>2,019 67</u>
Total receipts for the year.....	<u><u>\$9,327 67</u></u>

The receipts and earnings have been transmitted to the State Treasurer monthly, except interest on balances in hand, which has been remitted to the same official quarterly.

The Comptroller has honored a requisition made upon him quarterly for a fourth part of \$20,000 appropriated by chapter 84, Laws of 1890, "for salary of secretary and for actual and necessary expenses."

Of the treasurer's report herewith submitted, exhibiting in detail all receipts and disbursements for the fiscal year ended September 30, 1891, the following is a summary:

Balance on hand October 1, 1890..... \$3,531 97

Receipts.

Inclined Railway.	\$7,308 00
Rentals.	1,840 00
Sales	11 00
Rebate on freight	4 75
Interest	163 92
	<u>9,327 67</u>
From State treasury, as per chapter 84, Laws of 1890,	20,000 00
From State treasury, as per chapter 570, Laws of 1890,	4,785 18
From State treasury, as per chapter 302, Laws of 1891,	455 44
Total	<u>\$38,100 26</u>

Payments.

Pay-rolls at Niagara.....	\$15,896 89	
Labor, materials, etc	4,509 42	
Commissioners, treasurer, traveling ex- penses, etc	1,496 57	
Remitted to State Treasurer.....	9,327 67	
Permanent improvements	5,240 62	
	<hr/>	\$36,471 17
Balance September 30, 1891.....		\$1,629 09
		<hr/> <hr/>
Total receipts since organization of the commis- sion, 1883.....		\$187,234 50
Total disbursements.....		185,605 41
		<hr/>
Balance		\$1,629 09
		<hr/> <hr/>

The following is "an estimate of the work necessary to be done, and of the expenses of maintaining said Reservation for the ensuing fiscal year," ending with September 30, 1892:

Construction.

Roads, walks, grading and planting.....	\$25,000 00
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Maintenance.

Salaries, office and traveling expenses	\$4,300 00
Reservation police, watchmen, etc.....	5,400 00
Mechanics and laborers.....	7,000 00
Materials, tools, trees, etc.....	7,000 00
Miscellaneous.....	1,300 00
	<hr/>
Total	\$25,000 00
	<hr/> <hr/>

Estimated receipts from October 1, 1891, to September 30, 1892.

Inclined Railway.....	\$7,500 00
Cave of the winds	1,200 00
Ferry and steamboat landing.....	1,000 00

Carriage service.....	\$100 00
Baggage-room.....	50 00
Interest and other receipts	200 00
	<hr/>
Total	\$10,050 00
	<hr/> <hr/>

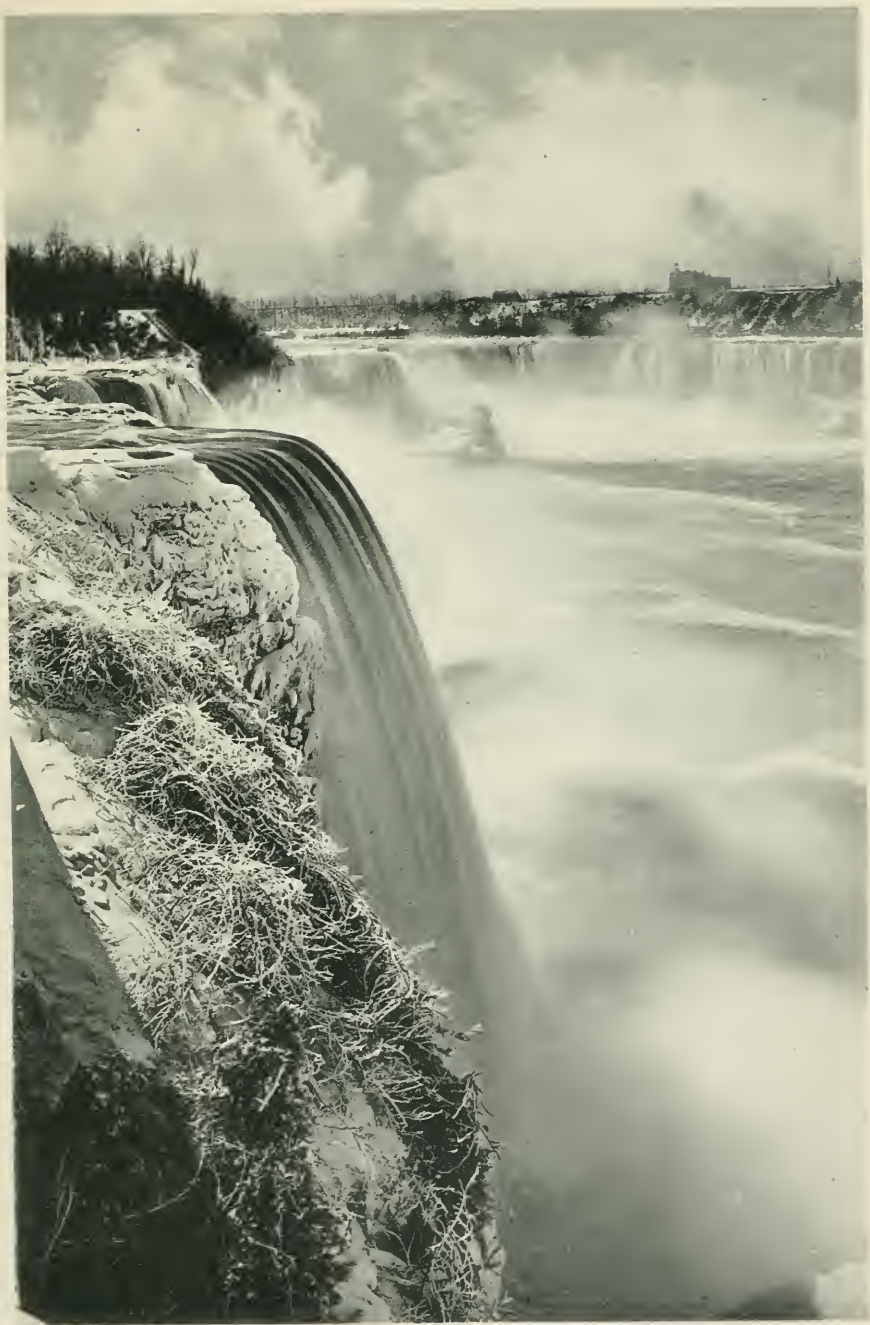
Professor James Hall's valuable essay on Niagara Falls, published in 1843, as a part of the "Natural History of New York," is reprinted and appended to this report.

Respectfully submitted.

ANDW. H. GREEN,
JAMES MOONEY,
JOHN HODGE,
JOHN M. BOWERS,
DANIEL BATCHELOR,

Commissioners of the State Reservation at Niagara.

REPORT OF THE SUPERINTENDENT
OF THE
STATE RESERVATION AT NIAGARA
FOR THE
Fiscal Year Ending September 30, 1891.



Report of the Superintendent.

To the Board of Commissioners of the State Reservation at Niagara:

GENTLEMEN.—I respectfully submit the annual report of the Superintendent.

MORE THAN 500,000 VISITORS.

There has been a large increase in the number of visitors to the Reservation during the fiscal year ending September 30, 1891. The number probably exceeded 500,000. It is difficult to estimate the number of visitors who arrived on the regular railroad trains. A record has been kept, and an approximate estimate made of the number of persons who arrived on special trains, containing visitors destined for the Reservation. During the excursion season, 4,790 cars arrived on special trains, containing an estimated number of 289,220 visitors. The statement of excursions herewith submitted shows, that while many excursions arrived from Canada and various States of the union, the greater number came from different localities in the State of New York.

Notwithstanding the great number of visitors, comprising persons in many different circumstances in life, no injury has been done to the property of the State, no disturbance has occurred, and no serious difficulty has been experienced in maintaining order.

There are many dangerous places within the Reservation, where imprudent persons venture, notwithstanding the

warnings to visitors, but no accident has occurred during the year. It is also true that no accident has occurred since the establishment of the Reservation.

During the summer months Prospect park was open until 11 o'clock P. M. The grounds were not lighted by electric-lights, at the expense of citizens of the village, as they were during the preceding year. The gas-lights in the grounds are insufficient. If the grounds were properly lighted by electric-lights, they would add greatly to the convenience and enjoyment of visitors.

RECEIPTS.

The receipts during the year from the Inclined Railway, rentals and sales amounted to \$9,159, nearly one-half the sum appropriated for the care and maintenance of the Reservation for the past year, to wit: \$20,000.

Receipts from the Reservation have been paid into the State treasury as follows: 1888, \$7,766.55; 1889, \$7,186.13; 1890, \$7,853.67; 1891, \$8,791.04; in all \$31,597.39.

The receipts for the last year have been the largest in the history of the Reservation. The receipts are mainly obtained from a nominal fee of five cents each way, charged for carrying passengers on the Inclined Railway in Prospect Park from the high bank to the foot of the falls and return. An elevator to serve a similar purpose is needed for the convenience of visitors at the Cave of the Winds, on Goat Island.

The receipts from such an elevator operated for a nominal charge of five cents each way, combined with the present receipts from the Inclined Railway, in Prospect Park, would render the Reservation substantially self-sustaining.

It may be well to ask the Legislature to appropriate \$31,597.39, the sum of the receipts from the Reservation, paid into the State treasury, for the construction of such

an elevator. It would be an unobjectionable source of revenue to the State, and a much needed convenience to the public.

WORK OF THE YEAR.

The principal works of the year have been the restoration of the damaged bank on the southern shore of Goat Island, extensive repairs upon the bridges, the erection of a large amount of substantial iron guard railing, the construction of commodious walks, platforms and stone steps along the parapet wall, and at Prospect Point, the construction of a covered balcony and stone pathways at the foot of the Inclined Railway, the removal of the embankment at Fourth street, the improvements made at Hennepin's View, and on Bath Island and the additions made to the plantations and to the nursery of young trees on Goat Island.

THE SOUTHERN BANK OF GOAT ISLAND.

The space behind the docking and crib-work recently constructed and the cavities in the damaged bank have been filled with dead and decayed wood, taken from the thicket on Goat Island so as to restore as nearly as possible the natural slope of the bank. The filling has been covered with wood mould, loam and a margin of green sward, and the bank planted with 3,317 cuttings, trees, shrubs and vines, comprising 700 cuttings of yellow willow, 110 cuttings of weeping willow, 1,900 cuttings of dwarf willow, thirty-six snow ball trees, fifty-eight purple lilacs, twenty-four white lilacs, nine red cedars, fourteen spireas, twelve euonymus, and 440 Virginia creeper.

The bank adjacent to the lower 500 feet of the crib-work was not damaged, but a large empty space existed behind the crib-work. This space has also been filled with dead wood so as to give the whole a finished

appearance. The crib-work is now barely noticeable from Goat Island.

During the past winter the docking and crib-work have admirably answered the purpose for which they were constructed, preventing erosion of the shore of Goat Island, at times of high water and floating ice.

The damaged bank has been almost entirely covered by vegetation in one season. Some additional planting will be needed, particularly at points where the bank has not yet reached the proper slope.

THE BRIDGES.

The eight additional pairs of iron needle-beams mentioned in the last report, have been placed in the bridge between Bath Island and Goat Island.

Only five pairs of wooden needle-beams remain in that bridge. After they shall have been replaced, the side-walks of the bridge may be widened about three feet, which will be a great convenience to the public.

The bridges from the main land to Goat Island, have been replanked with three-inch pine plank, planed and rounded, and a number of the stringers renewed.

The wood-work of all the bridges has been examined and repaired, and the bridges to the islands have been painted in stone color, with paint manufactured expressly for that purpose.

The dilapidated foot bridge, over the race to Willow Island, on the riverway has been removed, and a new foot bridge constructed.

One of the supporting timbers in the first pier of the bridge, from the mainland to Bath Island, which had been carried away by the current, has been replaced.

The portions of the piers under the water are composed of oak timbers, upon which the stone piers rest. The

second and third piers being in more exposed positions were encased with timber, some years before the property came into the possession of the State. The very low water during the past season, afforded an opportunity for close inspection of the timbers under the first pier. They show very perceptible signs of wear from floating ice, and they also should be covered by a strong crib-work of timber, to protect them from injury.

The bridge from Goat Island to Luna Island is old and should be replaced by a new structure.

IRON GUARD RAILING.

The picket fence along the high bank in Prospect Park, has been removed and 600 feet of iron railing of the pattern designed by Mr. Calvert Vaux, has been erected in its place; sixty-five stone posts, four feet long, have been imbedded in the ground, to which the iron standards of the railing are bolted. Four hundred feet of iron guard-railing of a similar pattern have been erected on the parapet wall at Prospect Point. Another rail has been added to the iron guard-railings on Luna Island and Terrapin Point, and the railing on Luna Island has been extended toward the head of the island. The iron guard-railing has also been extended around the large platform at Hennepin's View in Prospect Park. The bank at that point is largely composed of quicksand and has been sliding down so rapidly that the platform had to be moved back for safety. The raw bank presented an unsightly appearance, particularly when viewed from the Canadian side.

Workmen with ropes attached were let down over the bank and the soil removed down to the solid rock, upon which a crib-work of timber six feet high was constructed. The space behind the crib-work has been filled with loam,

staked to prevent sliding, covered with green sward and planted with vines and cuttings of willow.

There are several points along the high bank in Prospect Park and on Goat Island that would be benefited by similar treatment.

The iron guard railings have been painted an invisible green color and are a great and permanent improvement in Prospect Park, and a source of safety and enjoyment to visitors.

STONE STEPS.

The stone steps along the parapet wall in Prospect Park were so narrow that visitors could not pass conveniently. New steps of cut-stone flags, of suitable width, have been constructed. Stone walks and stone steps for the convenience of visitors have also been constructed over and around the great rocks at the base of the American Falls, which command favorable points of view.

PLATFORMS AT PROSPECT POINT.

The plank platforms and walks at Prospect Point were old and unsuitable for the increased number of visitors. New and suitable platforms and walks have been constructed, substantial cement gutters having been first laid to carry off the drainage along the parapet wall.

The new platforms and walks are much more commodious and sightly than the old, and add greatly to the convenience and enjoyment of visitors at that prominent point.

BUILDINGS.

A covered balcony has been constructed at the foot of the Inclined Railway on the western end of the building, and the platform extended on the southern side, which commands a view of the falls. An office for the ticket man has also been constructed at the foot of the

Inclined Railway. The roof of the machine-room and the veranda on the southern side of the Inclined Railway building and the main part of the hall building, in Prospect Park have been resingled and extensive repairs have been made upon the penstock in the Inclined Railway building.

The ice-house on Goat Island was not large enough to hold a sufficient amount of ice to supply the drinking fountains during the summer season. A second ice-house has been built in the lumber yard on Goat Island, old materials on hand being largely used for that purpose.

The pointing of the Inclined Railway building and the walls of the raceway have been repaired. Defective bricks have been removed from the walls of the office of the commissioners on Bath Island.

The Cave of the Winds building, the fountain and the stone steps in Prospect Park and the stone piers of the Luna Island stairway, have been repaired.

BATH ISLAND.

The large embankment on the riverway, east of Fourth street, has been removed. Two thousand five hundred loads of the material have been carted to Bath Island and used for grading and filling.

Bath Island is composed largely of made land, the material being stone and coal cinders, A covering six inches in depth of excellent loam from the embankment has been spread over the upper end of the island. The upper half of the docking has been removed from the eastern end of the island.

A rip-rap margin of stone has been placed along the shore outside the lower timbers of the docking. The margin of the island has been graded and covered with

green sward, which greatly improves the appearance of the locality. The island has been sown with grass seed, and planted with cedars and spruce.

NURSERY TREES AND PLANTATIONS.

Eleven hundred young trees and 120 shrubs have been added to the nursery on Goat Island. The trees comprise 100 each of Norway spruce, balsam fir, Scotch larch, Austrian pine, mountain pine, white pine, Scotch pine and 200 Scotch fir. The shrubs were taken from the thicket on the Reservation, and comprise twenty spirea, sixty euonymus and forty snowberry.

The deciduous trees in the nursery are making very rapid growth, and the conifers are generally looking well. A water-pipe has been extended through the center of the nursery with openings at proper distances.

The trees in the nursery have been carefully mulched and protected for the winter season, and stakes placed to indicate the different varieties. Fifty Norway spruce, fifty Scotch pines, seventy-five Austrian pines, ten Mugho dwarf pines, fifty Siberian arbor vitae and eighteen maples, have been purchased and planted at the old French landing along the riverway and on Bath Island.

Seventy-five Norway spruce and seventy-five arbor vitae, have been planted in the same localities.

The trees planted along the riverway are doing well, with the exception of a number of Norway spruce, which have failed.

The very dry weather in June was unfavorable for new plantations.

Nine horse chestnut trees, twenty years old, have been removed from the double row of trees adjacent to Prospect Park and transplanted along Canal street. There are ten additional trees, in the double row, that might be removed to advantage.

In Prospect Park there are in shaded or crowded places, which prevent their natural growth, sixteen horse chestnut, thirty-six box elders, five sumachs and four maples, twenty years old, which might be removed at the proper season to localities requiring plantation.

ROADS AND WALKS.

The approach to Goat Island has been macadamized with broken stone, and paved gutters constructed on each side. In order to widen the roadway at that difficult point the bank has been cut away and a stone walk constructed on the right-hand side, where none has heretofore existed. The stone walk on the left-hand side has also been rebuilt.

The carriage turn-out at Luna Island stairway, the center walk at Three Sister Islands and the walk from the Horseshoe Falls to the Three Sister Islands have been graveled and the plank walks on the main land repaired.

Three hundred and twenty-five yards of gravel have been placed on the roads in Prospect Park, on Cascade street and on Canal street.

Five hundred yards of gravel have been placed on the road on Goat Island and the roads and walks trimmed and kept in repair.

The survey for the proposed new road on Goat Island was commenced July 11, 1891. The use of the office on Bath Island and such assistance of the employees on the Reservation as was desired have been extended to the engineers employed upon the survey.

MISCELLANEOUS.

New signs and notices have been provided. A new cable and new wheels have been procured for the cars on the Inclined Railway.

The grounds have been mown at regular intervals, the young trees cultivated and watered, the pic-nic grounds kept in order, a large amount of dead wood and branches have been collected and removed from the thicket on Goat Island.

The bridges and stairways have been swept, the walks kept free from snow during the winter season and other incidental work performed.

EMPLOYES.

The number of regular employes is ten. The additional laborers employed during the year were as follows: October, sixteen; November, sixteen; December, nineteen; January, sixteen; February, nine; March, nine; April, nineteen; May, twenty; June, twenty; July, twenty; August, nineteen; September, ten.

One teamster has been steadily employed during the year, and one additional in October, three in April and one in May.

RESERVATION CARRIAGE SERVICE.

The Reservation Carriage Service commenced operations for the season May eighth, and quit running October fifteenth. The establishment of the Reservation Carriage Service has now become generally known to the traveling public, and during the past season visitors have availed themselves of the service to a greater extent than heretofore.

THE CAVE OF THE WINDS.

The privilege of conducting visitors through the Cave of the Winds, has been leased as heretofore.

Two complaints have been made against the guides employed at the Cave of the Winds.

One of the guides complained of has been dismissed.

LICENSED CARRIAGE DRIVERS.

During the year six complaints have been made against licensed carriage drivers. One carriage driver has been excluded from the Reservation for violation of the ordinances.

Eight public carriage stands have been designated upon the public street, within the Reservation, in the territory outside of Prospect Park and the islands, at points under the supervision of the Reservation police.

The arrangement is a convenience to the traveling public, and a benefit to the carriage drivers. The privilege of using such stands is subject to revocation, in case the drivers violate the ordinances of the commissioners.

The village ordinances relating to soliciting visitors on the streets, have been more rigorously enforced than in former years.

SHARP PRACTICE AT "POINTS OF INTEREST."

Many complaints have been made at this office by visitors concerning sharp practices at one or more of the "Points of Interest," at the Whirlpool and Whirlpool Rapids.

Visitors are frequently conveyed by drivers to those points without being informed that there is an entrance fee charged (usually fifty cents) for each person, of which the driver, in most cases, receives one-half in the form of "commission."

At the point of destination the sign telling the amount of the entrance fee is so arranged as not to be seen until visitors are returning to their conveyance, when the amount of the toll is demanded.

This method of doing business very properly gives rise to great indignation and annoyance of visitors. These

places are two or more miles distant from the falls, and are not included in the Reservation.

The practices named have been a great source of disgrace and reproach to Niagara as a watering place, and should be ventilated until abolished.

THE EXCLUSIVE LIVERY PRIVILEGES.

Chapter 565 of the Laws of 1890, entitled "An act in relation to railroads," section 34, provides :

"No preference for the transaction of business upon its cars or in its depots or buildings, or upon its grounds, shall be granted by any railroad corporation to any one of two or more persons, associations or corporations, competing in the same business or in the business of transporting property for themselves or others."

Notwithstanding this plain provision of the law the New York Central and Hudson River Railroad Company and the New York, Lake Erie and Western Railroad Company continue to rent the exclusive privilege of soliciting passengers on their trains, in the depots and in their depot grounds at their Niagara Falls stations to the Miller and Brundage Coach Company (limited).

This flagrant violation of law has a direct bearing upon the Reservation and the traveling public and the offence is aggravated because the coach company is a corporation which owns, operates or controls, or the stockholders of which own, operate or control, toll places, photograph galleries and stores, to which their passengers are conveyed, often without direction and before being taken to the Reservation to see the falls.

This in a large measure defeats the object of the State in establishing the Reservation, which were threefold, to wit: The removal of disfigurements, the restoration of the grounds and the protection of visitors.



I am advised that the statute against preferences, re-enacted in 1890, has been in one form or another the law of this State for a number of years. I know of no adjudication deciding the point until last summer, in the case of Durant against the Adirondack Railroad Company, which appears to be a parallel case with many existing here, with the difference that the violations of the law here, on the part of the railroad companies, are more flagrant, owing to the connection of toll-gates, photograph galleries and stores, with the preferences granted. In the Durant case the railroad company to preserve its contract giving the stage company exclusive rights in the transportation of passengers and baggage, undertook to prevent the entrance of the conveyance of Durant to the depot and yard.

The court granted an injunction in an opinion, a copy of which is herewith submitted.

NEW YORK SUPREME COURT.

DURANT AGAINST ADIRONDACK RAILROAD COMPANY.

Opinion.

By the laws of 1890, chapter 565, section 34, it is provided that "no preference for the transaction of business upon its cars, or in its depots or buildings, or upon its grounds, shall be granted by any railroad corporation to any one of two or more persons, associations or corporations competing in the same business, or in the business of transporting property for themselves or others." It is here shown that the Adirondack Stage and Transportation Company (limited), are allowed access to the yards of the defendant company, and that the conveyances of the plaintiff are refused admission to the yards. Seemingly, therefore, a case is presented where discrimination is made between two competing stage lines by the defendant railroad company. While it might have been competent and lawful for the defendant to exclude all stage lines

from its yards, I do not see upon what valid ground it can be claimed that the laws of 1890 cited do not apply. Cases holding that railroad companies may make such reasonable regulations as they see fit in regard to the conduct and management of their own business, have no application, the question here presented, being whether the defendant company has a right to discriminate between rival stage lines. Neither can the suggestion that the act is unconstitutional be given any weight upon a motion of this kind. As the case stands, the plaintiff has a statutory right to insist that no discrimination shall be made between him and any competing transportation company.

The court in granting preliminary injunctions, which practically gives the same relief as could be secured upon the trial, does so with reluctance. As stated in *Van Vechten v. Howland* (12 Abb. N. S., 461). "Such an injunction should not be granted or sustained unless without it the court could not by its final judgment, do justice between the parties.

"Applying this test it would be difficult to see just how justice could be done between the parties if, upon the trial the final relief should be awarded to the plaintiff. He certainly makes out a *prima facie* case upon this motion, and it is further made to appear that the result of the discrimination complained of would be to seriously embarrass his business, which is connected with the running of a summer hotel, and which would result in damages difficult to determine if the final determination should be in his favor. I am of the opinion, therefore, that the motion should be granted, with costs."

The opinion granting the application of the injunction, is regarded as decisive. Aside from the statute provided, the actions of the railroad companies should be forbidden, upon grounds of public policy alone. The majority of tourists coming to the Reservation, are now turned over in transit to the coach company, to be manipulated in stores, photograph galleries and at toll-gates, owned or controlled by the members of the company, for their financial benefit, while others competing in the same business are entirely excluded.

The coach company thus has a practical monopoly of business, which is an outrage alike upon the community and the traveling public.

At a hearing before Superintendent Voorhees of the New York Central and Hudson River Railroad, February 20, 1890, Messrs. Kaltenbach of the Hotel Kaltenbach, Hubbs of the Temperance House, Messrs. Charles Bierstadt and George Barker, photographers, and other hotel proprietors and business men, stated that the preferences granted were greatly injuring, and in the case of the photographers, had practically destroyed their retail business.

Notwithstanding these and many other complaints, and the statute especially forbidding preferences, the preferences are continued, and the grounds and buildings of the railroad companies for miles each side of Niagara Falls station are placarded with the sign boards of the coach company.

In accordance with the instructions of the commissioners to report such action as may be necessary to prevent further imposition upon the public, I again respectfully recommend that the complaints hereby made by the superintendent be submitted to the Railroad Commissioners and the Attorney-General of the State for investigation.

TABULAR STATEMENTS.

A statement of the excursions to the Reservation for the year ending September thirtieth is hereby appended; also detailed statements of the receipts and expenditures by the superintendent, the amount of the pay-rolls for each month, classifications of the pay-rolls and expenditures, and the number of persons employed during the year.

Respectfully submitted.

THOS. V. WELCH,
Superintendent.

STATEMENT OF EXCURSIONS, 1890-91.

*Number of excursion trains and places of departure, from October 1, 1890,
to September 30, 1891.*

Date.	WHERE FROM.	Number of cars.	Estimated number of visitors.
1890.			
Oct. 1	Punxsutawney, Pa., via Buffalo, Rochester and Pittsburg Ry.	12	720
4	Via West Shore railway	10	600
6	Buffalo, N. Y., "Patriotic Sons of America."	6	360
7	New York city, Hendrickson party.	3	180
9	New York city, Harlem river park emp'l.	1	60
10	New York city, Gen. B. Butler and party.	1	60
16	Kingston and Newburgh, N. Y., via West Shore railway	8	480
16	Buffalo, N. Y., Del. C. M. B. A.	4	240
17	Buffalo, N. Y., Street Car Men's Assn. Conv	3	180
21	Binghamton and Elmira, Christian En- deavor, via D., L. & W. Ry.	8	480
21	Buffalo, N. Y., Christian Endeavor, via D., L. & W. Ry.	13	780
24	New York city, rep. Iron & Steel Assn.	4	240
24	New York city, Synod State of New York.	5	300
28	New York city, British Iron & Steel Assn.	4	240
28	New York city, Am. Assn. Civil Engineers	4	240
		86	5,160
Nov. 13	Chicago, Ill., Hollanders en route to Hol- land.	4	240
1891.			
Feb. 23	Lockport, N. Y., Y. M. C. Association	6	360
May 8	Lockport, N. Y., Union school.	13	780
11	San Francisco, Cal., en route to New York	1	60
16	Oswego county, N. Y., public school ex- cursion, via R. W. & O. Ry.	7	420
17	Buffalo, N. Y., via New York Cent. Ry.	11	660
17	Buffalo, N. Y., via Erie railway.	4	240
22	Officers and students, Spanish man-of- war "Nautilus"	2	120
22	Utica, N. Y., masons ret'g from convention	5	300
22	Reunion Twenty-eighth Regiment.	2	120
24	Camp Niagara, Ont., "Queen's Own". Regiment.	4	240
24	Buffalo, N. Y., via N. Y. Central Ry.	16	960
24	Buffalo, N. Y., via Erie railway.	3	180

EXCURSIONS — (Continued).

Date.	WHERE FROM.	Number of cars.	Estimated number of visitors.
1891.			
May 25	Philadelphia, Pa., Select Knights.....	3	180
25	Ontario, Queen's Birthday Ex.....	7	420
25	Hamilton, Ont., "Foresters".....	5	300
25	Knight Templars en route to Erie, Pa..	8	480
		91	5,460
June 1	Buffalo, N. Y., via N. Y. Central Ry.....	15	900
1	Buffalo, N. Y., via Erie railway.....	5	300
3	Buffalo, N. Y., special party.....	2	120
5	Georgetown, Ont., via Grand Trunk Ry..	7	420
6	New York city, via Erie railway.....	6	360
6	Toronto, Ont., via Grand Trunk Ry.....	4	240
7	Buffalo, N. Y., via Erie railway.....	6	360
7	Buffalo, N. Y., via N. Y. Central Ry.....	13	780
7	Bradford, Pa., via Erie railway.....	4	240
7	Lockport, N. Y., via Erie railway.....	2	120
8	Buffalo, N. Y., "Nobles of the Mystic Shrine".....	3	180
9	Boston, Mass., Raymond Party.....	3	180
10	German Party en route to Europe.....	2	120
11	Toronto, Ont., West End Temp Society.	2	120
11	Rochester, N. Y., C. M. B. L.....	4	240
12	Liverpool and Whitby, Ont. via Grand Trunk railway.....	5	300
13	Jamestown, N. Y., via Buffalo, New York, and Philadelphia.....	9	540
14	Newark, Patterson, Jersey City, N. J., via Erie railway.....	25	1,500
15	Toronto, Ont., "St. Vincent de Paul Soc'y"	4	240
17	Cattaraugus, Little Valley & Gowanda school, via Erie railway.....	6	360
30	Bradford, Emporium & Franklinville, via Erie railway.....	10	600
19	Toronto, Ont., emp's. Grand Trunk Ry..	16	960
19	Port Jarvis, Ont., Baptist church.....	9	540
20	Rochester, N. Y., general excursion....	4	240
21	Bradford, Pa., via Erie railway.....	7	420
21	Jersey City, N. J., via Erie railway.....	4	240
21	Buffalo, N. Y., via Erie railway.....	4	240
21	Buffalo, N. Y., via N. Y. Central railway.	8	480
22	Toronto, Ont., Sextennial Legion.....	5	300
23	Buffalo, N. Y., union of Baptist churches.	15	900
24	Rochester, N. Y.....	7	420
24	New York city.....	1	60

EXCURSIONS — (*Continued*).

Date.	WHERE FROM.	Number of cars.	Estimated number of visitors.
1891.			
June 25	Buffalo, N. Y., St. Peter's German church	8	480
25	Hornellsville, N. Y., "Sextennial Legion"	10	600
25	Jamestown, N. Y., via Erie railway.....	5	300
25	Ingersoll, Ont.	7	420
26	Jamestown, N. Y., "Newtons".....	5	300
27	Toronto, Ont., "Sons of Temperance"...	3	180
27	East Aurora, N. Y., Teachers Bap't S'y. Sc.	3	180
27	Cincinnati, O., Del. Plumbers conv. . . .	3	180
28	Youngstown, O.	10	600
28	Rochester, N. Y., via West Shore R'y....	8	480
28	Buffalo, N. Y., via N. Y. Central R'y.	34	2,040
28	Buffalo, N. Y., via Erie R'y.	10	600
30	Binghamton & Susquehanna, via Erie R'y	10	600
30	Lockport, N. Y., Union of Church Soc'y.	9	540
30	Brockton & Dunkirk, Knights of Pythias	6	360
		346	20,880
July 1	Excursion over Buff. N. Y. & Phila. Ry...	6	360
1	Toronto, Ont., Dominion Day Exc.	10	600
1	Hamilton, Ont., Dominion Day Exc.	6	360
1	Rochester, N. Y., via West Shore Ry.	7	420
1	Attica, N. Y., Methodist church	7	420
2	Boston, Mass., Raymond party	6	360
4	Rochester, N. Y., via West Shore Ry ...	15	900
4	Cleveland, O., via Nickel Plate Ry.	12	720
4	Dayton, O., via Nickel Plate Ry.	8	480
4	Buffalo, N. Y., via N. Y. Central Ry.	20	1,200
4	Lockport, N. Y., via N. Y. Central Ry...	8	480
4	Lockport, N. Y., via Erie Railway.....	7	420
4	New York City, Schillerbund Society....	8	480
5	Buffalo, N. Y., via N. Y. Central Ry. ...	50	3,000
5	Rochester, N. Y., via West Shore Ry ...	10	600
5	Buffalo, N. Y., via Erie Railway	5	300
7	Buffalo, N. Y., via Erie Railway	5	300
7	Toronto, Ont., F. & A. M. Lodge	2	120
7	New York and Brooklyn Teachers	8	480
8	New England Soc. of Christian Endeavor en route to Minneapolis.	15	900
8	Toronto, Ont., Jarvis St. Baptist Church,	10	600
8	Savannah, Ga.	7	420
8	New York City, Beethoven Sing. Soc....	3	180
9	Buffalo, N. Y., St. John's Ch. South (German)	21	1,260
10	Jamestown & Chautauqua, via Erie Ry..	8	480

EXCURSIONS — (Continued).

Date.	WHERE FROM.	Number of cars.	Estimated number of visitors.
1891.			
July 11	Rochester, N. Y., via West Shore Ry....	6	360
11	Wheeling, W. Va.	4	240
11	Paterson & Newark, N. J.	14	840
12	Youngstown, O.	10	600
12	Cleveland, O., via Nickel Plate Ry.	11	660
12	Cincinnati, O., via Nickel Plate Ry.	9	540
12	New York City, via N. Y. Central Ry....	16	960
12	Jersey City, N. J., via Erie railway.	10	600
12	Brooklyn, N. Y., via N. Y. Central Ry....	10	600
12	Pittsburg, Pa.	14	840
12	Rochester, N. Y., via West Shore Ry....	9	540
12	Lockport, N. Y., via Erie railway.	5	300
12	Buffalo, N. Y., via N. Y. Central.	24	1,440
12	Philadelphia, Pa.	6	360
12	Bradford, Pa.	12	720
12	West Seneca, N. Y.	3	180
12	Buffalo, N. Y., via Erie railway.	8	480
13	St. Paul, Minn.	5	300
13	Dunkirk, N. Y., via Nickel Plate Ry....	7	420
13	Kansas City, Mo., Int. Education.	4	240
13	Jamestown, N. Y., Equitable Aid Union..	7	420
13	St. Catherines, Ont., Orange Lodge....	3	180
13	Chautauqua, N. Y.	6	360
13	Meadville, Pa.	2	120
13	Jamestown, N. Y.	2	120
14	Buffalo, N. Y., St. Paul's Ger. Luth. Ch..	16	960
14	Dundas, Ont., Baptist Church Society...	7	420
15	Buffalo, N. Y., Fridens Evangelical.	10	600
15	Lockport, N. Y., Universalist Ch. Soc'y..	7	420
15	Toronto, Ont., Int'l Educational Assn...	8	480
15	Buffalo, N. Y., Del. C. B. L. Conv.	4	240
16	Erie and Northeast, Pa., M. E. Ch. Soc...	9	540
16	Oil City and Sherman, via W. N. Y. & Pa. railway.	10	600
16	Toronto, Ont., Int'l Educational Assn...	10	600
17	Buffalo, N. Y., Del. Cath. Benev. Legion..	10	600
17	Buffalo, N. Y., Photographers' conv.	5	300
17	Toronto, Ont., Int'l Educational Assn...	8	480
17	Windsor and St. Thomas, Ont., employes M. C. railway.	57	3,420
18	Hamilton, Ont., W. E. Sanford Manufac- turing Co., tailors.	18	1,080
18	Galt, Ont., Dumfries foundry employes..	7	420
18	Boston, Mass., Raymond party.	6	360
18	Toronto, Ont., Int'l Educational Assn...	8	480

EXCURSIONS — (*Continued*).

Date.	WHERE FROM.	Number of cars.	Estimated number of visitors.
1891.			
July 19	Pittsburg, Pa., via Lake Erie railway...	13	780
19	Cleveland, O., Nickel Plate railway. ...	12	720
19	Lockport, N. Y., Erie railway	6	360
19	Buffalo, N. Y., New York Cent. railway..	17	1,020
19	Detroit, Mich., and Windsor, Ont., Knights of St. John.	10	600
19	Jamestown, N. Y., Swedish Singing Soc..	5	300
19	Peoria, Ill.	7	420
19	Lockport, N. Y., via Erie, Pa.,	5	300
19	Buffalo, N. Y., via Erie railway.	5	300
20	Toronto, Ont., St. Vincent de Paul Soc..	14	840
20	Toronto, Ont., Euclid Av. Baptist church.	6	360
21	Pittsburg, Pa., Y. M. Maennerchor Sing- ing Society.	3	180
21	Buffalo, N. Y., Hudson St. Baptist Ch...	10	600
21	Elmira, N. Y.	10	600
21	Minneapolis, Minn., Christian Endeav. As.	9	540
21	Toronto, Ont., British M. E. day teachers.	6	360
21	Youngstown, O., Chenango, Meadville, etc.	12	720
21	Pittsburg, Pa., Del., C. M. B. A.	7	420
21	Buffalo, N. Y., Chestnut St. M. E. Ch., col.	6	360
22	Toronto, Ont., City Comm'l Travelers ...	10	600
22	Toronto, Ont., Woodgreen M. E. Ch.	8	480
22	Buffalo, N. Y., St. Vincent's Inf. Asylum and Industrial school	6	360
22	Rochester, Medina, etc., via N. Y. C. Ry.	10	600
22	Pennsylvania Party via N. Y., P. & O. Ry.	10	600
23	Brooklyn, N. Y., German Dramatic club.	2	120
23	Tonawanda Union schools	4	240
23	Syracuse, N. Y., via. West Shore railway.	9	540
23	Toronto, Ont., Caledonian Society	8	480
23	Toronto, Ont., emps. Robertson's Candy Manufacturing Co.	8	480
24	Washington, D. C., emps. in U. S. capitol.	9	540
24	Chautauqua, N. Y., Newton's excursion .	8	480
24	Toronto, Ont., Citizens' excursion	3	180
24	Canandaigua, N. Y., via Peanut road ...	10	600
24	Toronto, Ont., employes Kilgore Paper Box and Bag Manufacturing Co.	10	600
25	Toronto Ont., employes Christie Brown Biscuit Manufacturing Co.	10	600
25	Hamilton, Ont., Canadian Breadmakers' Union	10	600
26	Philadelphia, Pa., special party.	7	420
26	Via Delaware, Lack. and Western Ry ...	20	1,200

EXCURSIONS — (Continued).

Date.	WHERE FROM.	Number of cars.	Estimated number of visitors.
1891.			
July 26	Port Huron, via Grand Trunk Ry	11	660
26	Buffalo, N. Y., via Erie railway	11	660
26	Buffalo, N. Y., via N. Y. Cen. railway ...	30	1,800
26	Lockport, N. Y., via Erie railway.....	4	240
26	Covington, Ky., Cincinnati, O., & Pitts- burg, Pa., via L. S. & M. S. railway...	16	960
26	Rochester, N. Y., via West Shore R'y ...	10	600
27	Toronto, Ont., Bond St. Cong'l. church..	5	300
28	Allegheny City, Franklin & Titusville...	9	540
28	Red Creek & Beach Creek, via R. W. & O.	8	480
28	Hamilton, Ont., St. Bernard Drill Corps, Knights Templar	8	480
28	Harrisburg & Williamsburg, via W. N. Y. & Phila. railway	16	960
29	Indianapolis & St. Louis, via "Big Four" railway	50	3,000
29	Toronto, Ont., Sons of England Society..	6	360
30	Toronto, Ont., Queens St. M. E. church..	6	360
30	Hamilton, Ont., employes Ward & Evell's Casket Manufacturing Co.....	8	480
30	Oil City, Olean, via W. N. & P. R'y.....	8	480
30	Toronto, Ont., Knights of Pythias	4	240
30	Harrisburg & Phila., North'n Cent'l R'y.	10	600
31	Toronto, Ont., Erskine Pres. church.	6	360
31	Cincinnati, Hamilton & Dayton railway..	90	5,400
		<u>1,312</u>	<u>78,720</u>
Aug. 1	Oswego, N. Y., Farmers' Exc., via R. W. & O. railway.....	17	1,020
1	Toronto, Ont., Doty Bicycle M'fg. Co ...	6	360
1	Rochester & Akron, N. Y., via W. S. R'y.	5	300
1	Maine G. A. R.....	3	130
2	From various points en route to Detroit.	165	9,900
2	Youngstown, O., via L. E. & L. S. & M. S. railway.....	15	900
2	Cleveland, O., via Nickel Plate railway..	12	720
2	Cleveland, O., via Lake Shore railway...	10	600
2	Pittsburg, Pa., via Lehigh Valley R'y...	12	720
2	Akron, O.	15	900
2	Lockport & Buffalo, N. Y., via Erie Ry..	8	480
2	Rochester, N. Y., via West Shore Ry....	9	540
2	Buffalo, N. Y., via N. Y. Central Ry.....	38	2,280
3	Toronto, Ont., Christie St. M. E. church.	7	420
3	Youngstown, O., G. A. R.....	60	3,600
4	Toronto, Ont., Zion church.....	5	300

EXCURSIONS — (*Continued*).

Date.	WHERE FROM.	Number of cars.	Estimated number of visitors.
1891.			
Aug. 4	Binghamton, N. Y.	10	600
4	Brooklyn, N. Y., & Newark, N. J.	13	780
4	Brantford, Ont., M. E. church.	6	360
4	Oil City, Youngstown & Meadville, Pa., Hope Hose Co.	14	840
4	Chautauqua Lake, via Buffalo, N. Y., and Pennsylvania Ry.	7	420
4	Jamestown, N. Y., via B. & S. W.	7	420
4	Franklin, Pa., via Allegheny Valley.	13	780
4	Hamilton, Ont.	10	600
5	Dundas, Ont., I. O. of O. F.	5	300
5	Detroit, Mich., new recruits ret'g from..	20	1,200
5	Detroit, Mich., Peninsular Press Assn. . .	3	180
5	Orangeville, Ont.	8	480
5	Toronto, Ont.	5	300
5	Bowmansville & Whitby.	6	360
6	Detroit, Mich., G. A. R.	10	600
6	Toronto, Ont., St. Matthews' church.	8	480
6	Lockport, N. Y., German Luth'rn church. .	8	480
6	Paris, Ont., M. E. church and S. S.	9	540
6	Salt Lake City, Temple of Honor.	5	300
6	Guelph, Ont., A. O. U. W.	24	1,440
6	Toronto, Ont., Knights of Foresters.	4	240
6	Oil City, Pa., via N. Y. & West. railway..	11	660
7	Kansas City, Keokuk, Burlington, Gales- burg, Peoria, Joliet and Chicago, via C. B. & Q. railway.	120	7,200
7	Chautauqua, N. Y.	9	540
7	Rochester, N. Y., via West Shore railway. .	8	480
7	Toronto, Ont., employes Barbara & Ellis Blank Book Manufacturing Co.	8	480
8	Evansville, Terre Haute, Vincennes and Indianapolis, G. A. R.	80	4,800
8	Charlotte and North Greece, N. Y., via R., W. & O. railway.	20	1,200
8	Detroit, Mich., G. A. R.	14	840
9	Lockport, N. Y., via Erie railway.	4	240
9	Buffalo, N. Y., via Erie railway.	6	360
9	Philadelphia, Pa.	7	420
9	Detroit, Mich. G. A. R.	9	540
9	Rochester, N. Y., via West Shore railway. .	8	480
9	Buffalo, N. Y., via New York Cent. Ry. . .	22	1,320
9	Buffalo, N. Y., via West Shore railway ..	8	480
10	Canada, civic holiday excursions from Hamilton, Peterboro and Toronto	33	1,980

EXCURSIONS — (*Continued*).

Date.	WHERE FROM.	Number of cars.	Estimated number of visitors.
1891.			
Aug. 11	Chautauqua, N. Y., "Newtons"	8	480
11	Bradford, Pa.	7	420
12	Bath, N. Y., via Erie railway	12	720
12	Ohio, Indiana, Illinois, via C. C. C. & I. Ry.	80	4,800
12	Attica and Rochester, N. Y., via N. Y. Cent. railway	13	780
12	Loyal, Ont., firemen's excursion	6	360
13	Lockport, N. Y., Luth'n and Bapt. Ch.	8	480
13	Galt, Ont.	9	540
13	Conneaut, Meadville, Shenango.	24	1,440
13	Chautauqua, N. Y., "Newton"	8	480
13	Pelham, Ont., 22 wagon loads		220
13	Pittsburg, Pa., Northern Central	12	720
15	Erie, Pa., City Iron Works	18	1,080
15	Southampton, Ont., Farmers' picnic.	9	540
15	Stratford, Ont.	12	720
15	Rochester, Medina, Gasport & Lockport, N. Y.	7	420
16	Buffalo, N. Y., via N. Y. Central R'y.	42	2,520
16	Rochester, N. Y., via N. Y. Central R'y.	10	600
16	Lockport, N. Y., via N. Y. Central R'y.	4	240
16	Lockport, N. Y., via Erie railway.	5	300
16	Lockport, N. Y., via Erie railway.	10	600
16	Buffalo, N. Y., via St. Shrewsbury.	8	480
16	Boston, Mass., via Raymond.	5	300
16	Buffalo, N. Y., via Erie railway	10	600
17	Sherburn & Owen Sound, Ont., "For- esters and A. O. U. W."	10	600
17	Toronto, Ont., Queen's Own Rifle Band.	10	600
17	Stratford, Ont., Civic Holiday	10	600
17	Fredricksburg, Va.	4	240
18	Chicago, Ills., & Valparaiso, Ind., via Nickel Plate.	46	2,760
18	Auburn & Syracuse, N. Y., via N. Y. Central railway	12	720
18	Stratford, Ont.	9	540
18	Colingwood, Ont.	11	660
18	Portage, Castile, Warsaw & Attica, N. Y.	12	720
18	Brantford, Ont., M. E. church.	11	660
19	Canton, O., United Church societies	18	1,080
19	Rochester, N. Y., via N. Y. Cent. railway.	12	720
19	Big Four railway excursion.	67	4,020
19	Columbus, Ohio	8	480
19	Philadelphia, Pa.	8	480
20	New York city, Exempt Firemen	6	360

EXCURSIONS — (*Continued*).

Date.	WHERE FROM.	Number of cars.	Estimated number of visitors.
1891.			
Aug. 20	Buffalo, N. Y., Peckham Street church..	14	480
20	Sunburg, Pa.	24	1,440
21	Detroit, Mich., Liederkrantz and Maennerchor.	5	300
21	Chautauqua, N. Y., "Newton"	8	480
21	Toronto, Ont., locomotive firemen	8	480
21	Buffalo, N. Y., Society American Florists.	8	480
21	Buffalo, N. Y., Society Sangerbund	2	120
22	Hamilton, Ont., empl. Grand Trunk Ry..	24	1,440
22	Chatham, Ont., empl. Grand Trunk Ry..	10	600
22	Woodstock, Ont., empl. Grand Trunk Ry.	8	480
22	Toronto, Ont.	7	420
22	Rochester, N. Y., via West Shore railway	10	600
22	Newark, N. J., via Erie railway.	12	720
22	Reunion Col. Porter's regiment.	8	480
23	Buffalo, N. Y., and Philadelphia railway..	20	1,200
23	Elmira, Binghamton and Morris via Erie railway.	18	1,080
23	Buffalo, N. Y.	30	1,800
23	Rochester, N. Y.	14	840
23	Bethlehem, and along Lehigh Valley Ry.	21	1,260
23	Philadelphia, Pa.	13	780
23	Elizabeth, N. J.	12	720
24	Toronto, Ont., A. O. U. W. and I. O. of O. F. societies.	6	360
24	Savannah, Ga., Knights of Elks.	5	300
24	New York city, Knights of Maccabees..	4	240
25	Lockhaven, Emporium, Eldred & Olean,	12	720
25	Chautauqua, N. Y., Newton.	8	480
25	Lewiston and Youngstown, N. Y., Union schools.	5	300
26	Cincinnati, Columbus and Cleveland, O., via C. C. C. & I. Ry.	24	1,440
26	Parkersburg, W. Va.	10	600
26	Hamilton, Ont., Knights of Maccabees..	14	840
26	Beamsville, Stony Creek and Welland, Ont.	12	720
26	Pittsburg, Pa., via Erie Ry.	10	600
27	Allegheny City, Franklin, Oil City, Corry, Mayville and along W. N. Y. & P. Ry.,	22	1,320
27	Portage and Arcade, via Erie Ry.	10	600
27	Tonawanda, N. Y., Union Ch. and S. S. .	7	420
27	N. Y. State, interior of, via Erie Ry.	10	600
27	Philadelphia, Pa.	9	540
28	Winchester, W. Va.	10	600

EXCURSIONS — (Continued).

Date.	WHERE FROM.	Number of cars.	Estimated number of visitors.
1891.			
Aug. 28	Oswego, N. Y., and along R. W. & O. Ry.,	7	420
28	Cincinnati, O., via C. C. C. & I. Ry.....	12	720
29	Toronto, Ont., St. Albans church choir..	6	360
29	Albany, Syracuse and Rochester, via West Shore Ry	12	720
29	Salamanca, Rochester, via Buffalo and Rochester Ry.	12	720
30	Jersey City and Port Jervis, via Erie Ry.,	12	720
30	Ridgeway, Bradford, Pa.	12	720
30	Via Western New York and Phil. Ry....	12	720
30	Rochester, N. Y., via West Shore Ry...	9	540
30	Lockport, N. Y., via Erie railway.....	10	600
30	Buffalo, N. Y., via Erie railway.....	10	600
30	Buffalo, N. Y., via N. Y. Central Ry.....	36	2,160
30	Buffalo, N. Y., via St. Shrewsbury.....		600
		<u>2,134</u>	<u>128,860</u>
Sept. 1	Erie, Pa., Clark's Business College.....	8	480
1	Elmira & Binghamton, N. Y., via D. L. & W. railway.....	10	600
2	Salt Lake City, Utah, en route to Engl'd.	4	240
3	Buffalo, N. Y., via St. Shrewsbury.....		200
3	Conneautville, Pa.	9	540
4	Chattanooga, Tenn.....	5	300
5	Oswego, N. Y., Harvest Picnic, via R. W. & O. railway	9	540
6	New York city { Co. B, 71st Regiment ..	4	240
	{ Arion Society.....	4	240
	{ Maennerchor	4	240
6	Rochester, N. Y., via West Shore Ry....	10	600
6	Buffalo, N. Y., via N. Y. Central Ry.....	36	2,160
6	Buffalo, N. Y., via Erie railway.....	16	960
6	Lockport, N. Y., via Erie railway.....	5	300
6	Rochester, N. Y., via Erie railway.....	6	360
6	Buffalo, N. Y., via St. Shrewsbury.....		800
6	Brooklyn, N. Y., Exempt & Vol. Firemen.	6	360
7	Erie, Pa., via Nickel Plate railway	12	720
7	Buffalo, N. Y., Labor Day.....	15	900
8	Manchester, Geneva, Canandaigua, Har- vest excursion.....	10	600
8	Philadelphia, Pa.	16	960
9	Philadelphia, Pa., Raymond Excursion..	8	480
9	Poughkeepsie, N. Y., Citizens' Vol. Fire Department.....	2	120

EXCURSIONS — (*Continued*).

Date.	WHERE FROM.	Number of cars.	Estimated number of visitors.
1891.			
Sept. 9	Emporium, via Western N. Y. and Philadelphia railway.....	10	600
9	Meeting Railway Agents.....	2	120
10	Allegheny City, Titusville, Corry, Mayville and Dunkirk, via Allegheny Valley and Pittsburg railway.....	12	720
10	Cleveland, O.....	12	720
10	Gallion, O.....	7	420
11	Marion, Cleveland and Youngstown, O., via N. Y. P. & O. railway.....	32	1,920
12	New York State along line of Erie Ry...	24	1,440
13	Detroit, Mich., Emp., Mabley & Co.....	12	720
13	Detroit, Mich., Emp., U. S. Mail Service..	10	600
13	Port Jervis, Middletown & Binghamton..	22	1,320
13	Buffalo, N. Y., via N. Y. C. railway.....	48	2,880
13	Buffalo, N. Y., via Erie railway.....	12	720
13	Lockport, N. Y., via Erie railway.....	5	300
13	Lockport and Rochester, N. Y., via N. Y. Central railway.....	14	840
13	Buffalo, N. Y., via St. Shrewsbury.....	6	360
14	Pittsburg, Foxburg, Franklin, Oil City and Titusville, via W. N. Y. & P. Ry..	10	600
14	Toronto, Ont.....	5	300
14	Jamestown, N. Y.	8	480
15	Warsaw and Hornellsville, N. Y., via Erie railway.....	8	480
15	Montreal, Can., via Grand Trunk Ry....	6	360
16	Toronto, Ont.....	5	300
16	Medina and Brockport, via N. Y. C. Ry..	6	360
17	Toronto, Ont.....	7	420
17	Carbondale, Pa.....	6	360
19	Toronto, Ont., returning from exposition.	7	420
20	Pittsburg, Pa., via Pitts. & L. E. Ry....	31	1,860
20	New York city, via Lehigh Valley Ry...	12	720
20	Rochester, N. Y., via West Shore Ry....	9	540
20	Logansport and Fort Wayne, Ind., via Wabash Ry., Germ. Am. R. C. Congress.	24	1,440
20	Buffalo, N. Y., via New York Cent. Ry..	24	1,440
20	Buffalo, N. Y., via West Shore railway..	10	600
20	Buffalo, N. Y., via Erie railway.....	8	480
20	Buffalo, N. Y., via St. Shrewsbury.....	5	300
20	Lockport, N. Y., via Erie railway.....	5	300
21	Rochester, N. Y., Germ. Am. R. C. Cong..	10	600
21	Pittsburg, Pa., Germ. Am. R. C. Congress, via Pitts. & L. E. railway.....	12	720

EXCURSIONS — (Concluded).

Date.	WHERE FROM.	Number of cars.	Estimated number of visitors.
1891.			
Sept. 22	Bath, N. Y., Soldiers' Home.....	10	600
22	Cleveland, Pittsburg and Rochester, Germ. Am. R. C. Congress.....	14	840
23	Bridgeport, Conn., Peck's Hygeia & Recn. Co., via Boston and Albany railway...	10	600
23	Little Valley, Salamanca and Bradford..	10	600
23	Along Susquehanna Valley and Erie Ry.	10	600
23	Buffalo, N. Y., Germ. Am. R. C. Cong...	8	480
23	Niagara University	3	180
25	Boston, Mass., Raymond party	8	480
25	Syracuse, Rochester, N. Y., via West Shore railway	12	720
26	New York city, Cook's excursion.....	8	480
27	Rochester, N. Y., via West Shore railway.	10	600
27	Buffalo, N. Y., via N. Y. Central railway.	22	1,320
27	Buffalo, N. Y., via West Shore railway ..	9	540
27	Buffalo, N. Y., via Erie railway.....	12	720
27	Buffalo, N. Y., via Str. Shrewsbury	8	480
27	Lockport, N. Y., via N. Y. Central railway	6	360
27	Lockport, N. Y., via Erie railway.....	4	240
		809	49,540

RECAPITULATION.

Year.	MONTH.	Number of cars.	Estimated number of visitors.
1890	October	86	5,160
1890	November	4	240
1891	February	6	360
1891	May	91	5,460
1891	June	348	20,880
1891	July	1,312	78,720
1891	August	2,134	128,860
1891	September	809	49,540
		4,790	289,220

REPORT OF THE TREASURER

FOR THE

FISCAL YEAR BEGUN OCTOBER 1, 1890, AND ENDED
SEPTEMBER 30, 1891.

THE COMMISSIONERS OF THE STATE RESERVATION AT NIAGARA, *in account*
with HENRY E. GREGORY, *Treasurer.*

1890.

Oct.	1.	By balances on hand at this date	\$3,531 97
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RECEIPTS.

Oct.	25.	Quarterly advance from the State Comptroller.....	\$5,000 00
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1891.

Jan.	15.	Quarterly advance from the State Comptroller.....	5,000 00
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April	8.	Quarterly advance from the State Comptroller.....	5,000 00
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July	3.	Quarterly advance from the State Comptroller.	5,000 00
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20,000 00

*Special appropriation as per chapter 570, Laws
of 1889, for "repairs of roads, bridges and
betterments on the Reservation."*

1890.

Oct.	18.	Payment by the State Comptroller on account.	\$435 11
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Nov.	22.	Payment by the State Comptroller on account.	383 00
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Dec.	13.	Payment by the State Comptroller on account.	858 75
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1891.

Jan.	17.	Payment by the State Comptroller on account.	582 50
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Feb.	4.	Payment by the State Comptroller on account.	258 43
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1891.

May	7.	Payment by the State Comptroller on account.	\$747 30	
May	27.	Payment by the State Comptroller on account.....	899 35	
June	11.	Payment by the State Comptroller on account.....	620 74	
			<hr/>	\$4,785 18

*Special appropriation as per chapter 302, Laws
of 1891, for "the construction of roads, walks
and other improvements on the Reservation."*

1891.

Aug.	28.	Payment by the State Comptroller on account.	\$124 20	
Sept.	17.	Payment by the State Comptroller on account.....	331 24	
			<hr/>	455 44

1890.

Nov.	1.	Draft on Cataract bank for Octo- ber receipts.....	\$301 05	
Dec.	1.	Draft on Cataract bank for Novem- ber receipts.....	86 40	
Dec.	31.	Draft on Cataract bank for Decem- ber receipts.....	37 35	

1891.

Feb.	2.	Draft on Cataract Bank for Jan- uary receipts.....	50 15	
March	2.	Draft on Cataract Bank for Feb- ruary receipts.....	71 45	
	31.	Draft on Cataract Bank for March receipts.....	69 45	
May	1.	Draft on Cataract Bank for April receipts.....	77 10	
June	1.	Draft on Cataract Bank for May receipts.....	441 55	
	30.	Draft on Cataract Bank for June receipts.....	817 00	
July	31.	Draft on Cataract Bank for July receipts.....	1,947 05	
Sept.	2.	Draft on Cataract Bank for August receipts.....	3,183 40	
	30.	Draft on Cataract Bank for Sep- tember receipts.....	2,081 80	
			<hr/>	9,163 75

1890.

Dec.	31.	Interest on balances in Manufacturers and Traders' Bank.....	\$37 61
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1891.

March	31.	Interest on balances in Manufacturers and Traders' Bank	39 59
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June	30.	Interest on balances in Manufacturers and Traders' Bank.....	42 63
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Sept.	30.	Interest on balances in Manufacturers and Traders' Bank.....	44 09
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 \$163 92

 \$38,100 26

EXPENDITURES.

1890.	No. of abstract.	No. of voucher.		
Nov. 1.	LVII	725.	Pay-roll at Niagara for October.....	\$1,318 17
	LVII	726.	Thomas V. Welch, super- tendent, expenses.....	28 99
Dec. 1.	LVII	727.	Pay-roll at Niagara for November	1,394 19
	LVII	728.	Wm. Thurecht, repairing roads, etc.....	76 13
	LVII	729.	Jas. McCarthy, repairing roads, etc.....	84 88
	LVII	730.	Thomas V. Welch, superin- tendent, office expenses,	13 80
8.	LVII	731.	Phillips & Co., nails.....	2 98
	LVII	732.	P. B. Secord, lumber	65 93
	LVII	733.	P. C. Flynn & Son, painting.....	390 97
	LVII	734.	F. Lauzan, slating roof, etc.....	142 80
	LVII	735.	H. S. Ware, hardware. ..	73 58
	LVII	736.	Philpott & Leuppie, ma- chine work.....	21 96
	LVII	737.	Henry E. Gregory, treas- urer and secretary, sal- ary October & November	183 33
	LVII	738.	Ellenbaum & Co., coal....	14 25
				<hr/> \$3,811 96

1890.	No. of abstract.	No. of voucher.			
Dec. 16.	LVIII	739.	Daniel Batchelor, commis- sioner, traveling ex- penses.....	\$21 75	
	LVIII	740.	Jas. B. Lyon, State Printer, printing.....	83 20	
24.	LVIII	741.	John Hodge, commis- sioner, traveling ex- penses.....	38 34	
31.	LVIII	742.	Pay-roll at Niagara for December.....	1,186 80	
	LVIII	743.	Thomas V. Welch, super- intendent, office and traveling expenses....	40 70	
	LVIII	744.	Henry E. Gregory, treas- urer and secretary, sal- ary for December.....	91 67	
	LVIII	745.	Henry E. Gregory, treas- urer and secretary, office expenses.....	16 75	
1891.				<hr/>	\$1,479 21
Jan. 12.	LIX	746.	James Mooney, commis- sioner, traveling ex- penses.....	\$49 87	
28.	LIX	747.	Niagara Falls Printing House, printing.....	7 00	
	LIX	748.	O. Canfield, coal.....	22 50	
	LIX	749.	Ellenbaum & Co., coal...	19 00	
	LIX	750.	H. S. Ware, hardware....	9 05	
	LIX	751.	E. O. Babcock, stationery,	12 78	
	LIX	752.	Wm. Young, cartage....	4 85	
	LIX	753.	John Sullivan, broken stone	7 63	
	LIX	754.	George E. Wright, labor..	6 15	
	LIX	755.	Henry E. Gregory, treas- urer and secretary, office expenses.....	6 65	
	LIX	756.	Jackson Lumber Co.....	15 00	
				<hr/>	160 48
Feb. 2.	LX	757.	John Hodge, commissioner, traveling expenses	\$24 30	
	LX	758.	Daniel Batchelor, commis- sioner, traveling ex- penses	9 55	

1891.		No. of abstract.	No. of voucher.		
Feb. 2.	LX			759. Pay-roll at Niagara for January	\$1,086 17
	LX			760. Thomas V. Welch, superin- tendent, office expenses, etc.....	48 43
	LX			761. Jas. McCarthy, teaming..	42 00
5.	LX			762. James Mooney, commis- sioner, traveling ex- penses	25 85
Mch. 2.	LX			763. Pay-roll at Niagara for February.....	1,054 17
	LX			764. Thomas V. Welch, superin- tendent, office expenses,	6 00
31.	LX			765. Pay-roll at Niagara for March.....	1,141 42
	LX			766. Thomas V. Welch, superin- tendent, office expenses, etc	24 16
	LX			767. Henry E. Gregory, treas- urer and secretary, sal- ary, January, February, March	275 00
	LX			768. Maloney & McCoy, ice...	86 00
	LX			769. Ellenbaum & Co., coal...	4 75
	LX			770. P. B. Secord, lumber	9 78
	LX			771. O. Canfield, coal.	38 00
	LX			772. H. S. Ware, hardware....	20 93
	LX			773. John Johnson, blacksmith work.....	25 26
	LX			774. F. Lauzan, slating, etc...	15 00
	LX			775. T. R. Thomas & Co., seed,	9 00
	LX			776. Henry E. Gregory, treas- urer and secretary, office and traveling expenses,	21 04
					<hr/> \$3,966 81
May 1.	LXI			777. Daniel Batchelor, commis- sioner, traveling ex- penses	\$19 88
	LXI			778. Pay-roll at Niagara for April.....	1,378 92

1891.	No. of abstract.	No. of voucher.			
May 1.	LXI	779.	Thomas V. Welch, superin- tendent, office expenses, etc	\$21 85	
	LXI	780.	Jas. McCarthy, teaming..	87 50	
	LXI	781.	Thomas Lane, teaming...	75 25	
	LXI	782.	Jos. Gordon, teaming	24 50	
	LXI	783.	John Hayes, teaming	5 25	
June 1.	LXI	784.	Pay-roll at Niagara for May.....	1,492 55	
	LXI	785.	Thos. Lane, tree planting,	28 00	
	LXI	786.	James McCarthy, tree planting.....	99 75	
	LXI	787.	Thomas V. Welch, superin- tendent, office expenses, etc.....	12 94	
12.	LXI	788.	Phillips & Co., tools, etc.,	16 27	
	LXI	789.	The Howard Iron Works,	20 00	
	LXI	790.	T. R. Thomas & Co., seed .	3 95	
	LXI	791.	P. B. Secord, lumber.....	45 40	
	LXI	792.	H. F. McBride, carpenter work.....	4 70	
	LXI	793.	William Shepard, mason work	58 68	
	LXI	794.	P. C. Flynn & Son, painting,	78 16	
	LXI	795.	O. Canfield, coal.....	19 10	
	LXI	796.	Geo. H. Burdick, repairs..	10 00	
	LXI	797.	H. S. Ware, hardware....	296 31	
	LXI	798.	Geo. E. Wright, hardware,	78 35	
	LXI	799.	Henry E. Gregory, treas- urer and secretary, office expenses.....	43 18	
					\$3,920 49
16.	LXII	800.	Daniel Batchelor, commis- sioner, traveling ex- penses	\$24 23	
24.	LXII	801.	James B. Lyon, State prin- ter, printing.....	171 80	
30.	LXII	802.	Pay-roll at Niagara for June.....	1,544 32	
	LXII	803.	James McCarthy, teaming and sprinkling.....	101 50	

		No. of abstract.	No. of voucher.		
June 30.	LXII	1891.		804. Thomas V. Welch, super- intendent, office ex- penses, etc.....	\$24 65
	LXII			805. Henry E. Gregory, treas- urer and secretary, sal- ary April, May and June,	275 00
	LXII			806. Henry E. Gregory, treas- urer and secretary, trav- eling expenses.....	42 50
	LXII			807. Rehm & Co., national flag,	10 00
	LXII			808. Hotel Kaltenbach	18 50
					<hr/>
					\$2,212 50
July 31.	LXIII			809. Pay-roll at Niagara for July	\$1,568 44
	LXIII			810. James McCarthy, sprink- ling and teaming.....	98 00
	LXIII			811. Thomas V. Welch, super- intendent, office ex- penses, etc.....	14 65
Aug. 21.	LXIII			812. William Shepard, mason work	144 20
	LXIII			813. Geo. E. Wright, repairs...	136 58
	LXIII			814. H. S. Ware, hardware....	172 21
29.	LXIII			815. Geo. E. Wright, repairs...	313 46
Sept. 1.	LXIII			816. Pay-roll at Niagara for August	1,546 32
	LXIII			817. James McCarthy, sprink- ling and teaming.....	98 00
	LXIII			818 Thomas V. Welch, super- intendent, office ex- penses, etc.....	28 00
10.	LXIII			819 Daniel Batchelor, commis- sioner, traveling ex- penses	16 61
30.	LXIII			820. Geo. W. Tift, Sons & Co., iron	45 10
	LXIII			821. E. O. Babcock, stationery,	12 27
	LXIII			822. P.C. Flynn & Son, painting,	36 90
	LXIII			823. Philpott & Leuppie, black- smith work.....	9 20

1891.	No. of abstract.	No. of voucher.		
	LXIII	824.	Marshall & Finnell, bridges	\$44 39
Sept. 30.	LXIII	825.	Wm. Walls' Sons, cable...	94 80
	LXIII	826.	Wm. Young, cartage.....	3 25
	LXIII	827.	John Johnson, repairs....	19 12
	LXIII	828.	H. S. Ware, hardware....	298 25
	LXIII	829.	Geo. E. Wright, shingling,	44 00
	LXIII	830.	Henry E. Gregory, treas- urer and secretary, sal- ary July, August and September	275 00
	LXIII	831.	Henry E. Gregory, treas- urer and secretary, office expenses	17 57
	LXIII	832.	Pay-roll at Niagara for September	1,185 42
	LXIII	833.	James McCarthy, sprink- ling and teaming	98 00
	LXIII	834.	Thomas V. Welch, super- intendent, office ex- penses	31 69
				<hr/> \$6,351 43 <hr/>

*Payments out of \$15,000 appropriated by chapter 570, Laws of 1889, for
"repairs of roads, bridges and betterments on the Reservation."*

1890.	No. of abstract. Series A.	No. of voucher.		
Oct. 20.	III	19.	P. B. Secord, repairs to bridges, etc.....	\$25 88
	III	20.	Geo. E. Wright, repairs to bridges, etc.....	31 65
	III	21.	Marshall & Finnell, repairs to bridges, etc.....	197 16
	III	22.	W. A. Frazer, carpenter work.....	25 90
	III	23.	Wm. Shepard, labor and material for spring house	50 77
	III	24.	H. S. Ware, paint for buildings.....	103 75
				<hr/> \$435 11

1890.	No. of abstract.	No. of voucher.			
Nov. 7.	IV	25.	Special pay-roll at Niagara,	\$248 25	
	25.	IV	26. Fred W. Kelsey, trees....	134 75	
Dec. 15.	IV	27.	Phillips & Co., needle beams for bridges.....	623 40	
	IV	28.	Marshall & Finnell, repairs to bridges.....	123 50	
	IV	29.	John Sullivan, material for road	50 63	
	IV	30.	Coleman Nee, material for road	24 75	
	IV	31.	C. Delmage, material for road	9 00	
	IV	32.	O. F. Wright, material for road	7 88	
	IV	33.	John Sullivan, material for road	6 75	
	IV	34.	W. A. Frazer, material for road	12 84	
				<hr/>	\$1,241 75
1891.					
Jan. 19.	V	35.	Jos. Gordon, grading ...	\$21 00	
	V	36.	Robert Caul, grading....	56 00	
	V	37.	Wm. Thurecht, grading..	56 00	
	V	38.	Thomas Lane, grading...	56 00	
	V	39.	Jas. McCarthy, grading..	87 50	
	V	40.	Patrick McMahon, grad- ing	56 00	
	V	41.	Special pay-roll at Niagara,	250 00	
				<hr/>	582 50
Feb. 5.	VI	42.	P. A. Johnson, stone....	\$102 70	
	VI	43.	Wm. A. Frazer, material..	45 73	
	VI	44.	F. Lauzun, labor....	45 00	
	VI	45.	Jas. Reynolds, iron railing,	65 00	
				<hr/>	258 43
May 8.	VII	46.	The Jackson Architectural Iron Works.....	\$600 00	
	VII	47.	James Reynolds.....	147 30	
				<hr/>	747 30

1891.	No. of abstract.	No. of voucher.			
May 28.	VIII	48.	H. S. Ware, iron railing..	\$77 67	
	VIII	49.	Stephen Thompson, roads,	162 50	
	VIII	50.	The Jackson Lumber Co., bridges	659 18	
					\$899 35
June 12.	IX	51.	Geo. E. Wright, bridges..	\$41 04	
	IX	52.	Fred. W. Kelsey, trees...	10 75	
	IX	53.	Wm. Shepard, stone.....	110 75	
	IX	54.	Walter Latta, trees	8 10	
	IX	55.	Elwanger & Barry, trees,	102 95	
	IX	56.	Marshall & Finnell, bridges	347 15	
					620 74

Payments out of \$15,000 appropriated by chapter 302, Laws of 1891, for "the construction of roads, walks and other improvements on the Reservation,"

1891.	Series B.				
Aug. 31.	I	1.	Aug. S. Kibbe, surveying,	\$124 20	
Sep. 18.	I	2.	Aug. S. Kibbe, surveying,	175 00	
	I	3.	Joseph Sweeny, survey- ing	61 12	
	I	4.	Edward J. Waldron, sur- veying.....	63 62	
	I	5.	Michael Hanrahan, sur- veying	31 50	
					445 54

Remittances to the State Treasurer.

1890.					
Nov.	1.	Draft for October receipts	\$301 05		
Dec.	1.	Draft for November receipts	86 40		
	31.	Draft for December receipts	37 35		
1891.					
Feb.	2.	Draft for January receipts.....	50 15		
Mar.	2.	Draft for February receipts	71 45		
	31.	Draft for March receipts	69 45		
May	1.	Draft for April receipts.....	77 10		
June	1.	Draft for May receipts	441 55		
	30.	Draft for June receipts.....	817 00		
July	31.	Draft for July receipts	1,947 05		
Sept.	2.	Draft for August receipts	3,183 40		
	30.	Draft for September receipts.....	2,081 80		
					9,163 75

1890.

Dec. 31. Interest for quarter remitted..... \$37 61

1891.

Mar. 31. Interest for quarter remitted..... 39 59

June 30. Interest for quarter remitted..... 42 63

Sept. 30. Interest for quarter remitted..... 44 09

 \$163 92

1891.

\$36,471 17

Sept. 30. Cash balance in treasurer's hands 1,629 09

 \$38,100 26

HENRY E. GREGORY,

Treasurer.

Report, vouchers and certificates examined and found correct.

DANIEL BATCHELOR.

CLASSIFICATION OF ACCOUNTS.

Secretary and treasurer	\$1,100 00
Secretary and treasurer, traveling expenses	55 50
Secretary and treasurer, office expenses.....	92 19
Commissioners expense.....	248 88
Signs.....	36 38
Seed	13 95
Tools.....	194 02
Cartage.....	8 10
Water supply	73 46
Fences	13 50
Printing.....	262 00
Railing	414 26
Prospect park.....	1,387 36
Bath Island.....	216 88
Sidewalks.....	169 11
Police.....	5,400 00
Race	10 00
Salary (Niagara).....	2,900 04
Bridges ..	503 55
Office expense (Niagara).....	198 08
Inclined railway, maintenance, repairs, etc.....	2,134 53

Expense	\$10 00
Goat Island	1,191 14
Roads	2,127 28
Stationery	25 05
Trees	241 20
Ice.	140 53
Crosswalks	3 99
Water pipes	88 13
Gas	20 05
Coal	117 60
Walks	960 28
Buildings	614 24
Stairway	45 36
Cribbing	31 50
Nursery	446 15
Tree planting	355 88
Platform	52 71
	<hr/>
	\$21,902 88
Special improvements under chapter 570 of the Laws of 1889	4,785 18
Special improvements under chapter 302 of the Laws of 1891	455 44
	<hr/>
	\$27,143 50
	<hr/> <hr/>

REPORT OF THE SURVEY TO DETERMINE THE CREST LINES OF THE FALLS OF NIAGARA IN 1890.

[Pages 96-116. Seventh Annual Report of the Commissioners of the State Reservation
at Niagara. Assembly Document No. 45, 1891.]

ERRATA.

OFFICE OF THE STATE ENGINEER AND SURVEYOR, }
ALBANY, N. Y., January 15, 1892. }

Page 103, eighth line, for *list* read *lists*.

Page 103, fifteenth line, for *were as* read *were used as*.

Page 104, sixth line, for *fixture* read *fixation*.

Page 107, third line, in blank space insert *about eighty-two*.

Page 107, seventh line, for 2848.3 read 2848.5.

Page 107, tenth line, for 3261.3 read 3281.3.

Page 111, twenty-second line, for 44 read 45. This correction should also be made on the 1890 map.

Additional monuments.

In July, 1891, three more of the 1842 stone monuments were identified on Goat Island and their location carefully determined. They are described and their co-ordinates given in the following table :

Designation.	DESCRIPTION.	CO-ORDINATES.	
		Feet.	Feet.
T. P. No. 4½ ..	Not mentioned in the 1842 report as monumented, but the stone was found in excellent condition, projecting about six inches above ground, marked [⊕] on top, about 115 feet from the southeast corner of the "Cave of the Winds" dressing rooms, and about 25 feet south of the short-cut path.....	S. 1317.1	W. 588.8
T. P. No. 5	Dressed stone monument like last, but very much worn on the corners and top by carriage wheels. Stands in the roadway, 49 feet 3 inches southeasterly from monument M	S. 1956.2	W. 1164.8
Witness to T. P. No. 6	Dressed stone monument like preceding, in excellent condition, projecting about six inches out of the ground, and distant from T. P. No. 6 132 feet 3 inches by the present State standard..	S. 2319.2	W. 868.6

APPENDIX.



BIRDSEYE VIEW OF NIAGARA FALLS AND THE SURROUNDING COUNTRY.

NIAGARA FALLS.

[From the Final Report of the 4th Geological District of the State of New York, 1843.]

By JAMES HALL, State Geologist.

ITS PAST, PRESENT AND PROSPECTIVE CONDITION.

Among the phenomena of waterfalls and river gorges, the cataract of Niagara is justly regarded as holding the first rank, and as standing an index in the path of time, by which the influence of numberless ages upon the surface of our planet may be recorded. Its present, its former and its prospective conditions have engaged the investigation and speculation of many philosophers. The possible consequences of its entire reduction, and the drainage of the upper lakes, have excited the wonder and the apprehensions of many. The estimated time of its recession has sprinkled grey hairs among the fresh locks of the young and blooming earth, and alarmed those who would consider her still youthful in years.

But amid all these speculations, Niagara still remains; the thunder of its cataract still reverberates through its deep chasms, and its ocean of waters still rolls on as, unknown to the white man, it rolled a thousand years ago. When we come to the investigation of facts, we find that, except to travelers and the aborigines, Niagara was unknown until within the last fifty years; and that even during this time no accurate observations have been made, no monument erected to determine whether the falls are retrograding or not. The testimony of living witnesses and historical evidence unite in confirming the opinion that the water is wearing away the rock, and that the outline of the falls has changed. From these general observations, it has been estimated that they have receded at the rate of about forty feet in fifty years. Without pretending to question the accuracy of this or any other estimate of the kind, or to establish any rate of retrogression in the falls, we may examine its present, and from numerous facts infer its past condition; and from these we are entitled to draw an inference for the future, though without specifying time.

Both in relation to the former condition and to the future recession of the falls, we may regard the problem as undecided with respect to time. So many disturbing causes are constantly presenting them-

selves, that, although the great principles may be regarded as established, still it is impossible to calculate accurately the effect of these minor influences. The recession of every mile changes the whole aspect: new elements are brought into operation; the nature of the strata varies; the relative height of certain portions, and the elevation of the whole cascade is altered; and we have had time to observe only one of the phases, and to reason from that to the future, before the condition is changed, and we must take into the account new influences, which the previous changes have called into operation.

The great difference in elevation between Lake Ontario and Lake Erie, and the occurrence of the cataract of Niagara, form one of the most striking features in the topography of western New York. The difference in elevation of the upper great lakes is comparatively small; they being nearly in the range of the strike of the strata, while the passage from Lake Erie to Lake Ontario is directly across the line of dip.* Lake Erie is 334 feet above Lake Ontario, and the greater part of the descent from one to the other is overcome by the rapids and falls of the Niagara river in the space of one mile.

The series of limestones forming the Helderberg mountains in the eastern part of New York, extend westward throughout the whole length of the State, gradually diminishing from the thinning out of some of the members; and crossing the Niagara at the outlet of Lake Erie, they extend far westward into Canada, and form, for many miles, the southern shore of Lake Huron, and the eastern shore of Lake Michigan. This limestone dips to the south, passing beneath the water, and forming to some extent the bed of Lake Erie. It forms the second great terrace south of Lake Ontario, over the outcropping edge of which, on the north, we descend to a low, level country, underlaid by the shales and marls of the Onondaga salt group, which extends for fifteen or eighteen miles. Beyond this point there is a gradual and almost imperceptible ascent for seven or eight miles, when we come to the edge of the first great terrace overlooking the present valley of Lake Ontario. From this we plunge down for 250 feet, over the outcropping edges of various strata, which here terminate abruptly, to the low table land bordering the lake. From the base of this escarpment, the plateau, on which Lewiston and Queenston stand, slopes almost imperceptibly to the level of the lake, which is seven miles distant, and 120 feet lower.

A great portion of the country for twenty miles north of the southern terrace is so low and level, that a rise in the river for thirty

*The geological positions of Lake Superior and Lake Ontario, the highest and the lowest of this chain of lakes, correspond very nearly with each other.

feet would inundate an extent of many miles on both sides.* The ascent from this low country toward the north is very gradual; but when we arrive at the edge of the great terrace above Lewiston, the elevation is thirty-eight feet above Lake Erie. The accompanying section from Lake Erie to Ontario, presents an outline of this portion of the country.

This great terrace and escarpment, through which the Niagara makes its way into the valley of Lake Ontario, is known in New York as the *Mountain Ridge*, and in Canada as *Queenston Heights*. It continues to the westward of Niagara river, curving around the head of Lake Ontario, and thence trending westerly, some of its members extend beyond the Mississippi river. To the eastward, it is distinctly traceable as far as the Genesee river; beyond which it merges in the general level, and the rocks forming it disappear almost entirely, from thinning out, before reaching the Hudson river. The abrupt termination of these various strata upon the face of the escarpment, prove conclusively the extent and effect of denuding agency upon this part of the surface. The basin of Ontario, on the north of this terrace, has evidently been excavated from the sedimentary strata; the limit of the force, and the extent of the lake basin, being the line of this escarpment.

It is quite unnecessary, in the present instance, to controvert the opinion which has been advanced, of a dislocation of the strata, by which those forming the terrace have been elevated to their present position. They are continuously exposed both on the north and south of the escarpment, and it is very plain that no such change has taken place. The accompanying section, and also the section, Plate IV., illustrate the order of succession among the strata.

Here, instead of any evidence of disturbance in the strata, we find the most unequivocal proofs of denuding action, which has entirely removed the materials once forming the continuation of these strata on the north. It will be seen that the strata, consisting of alternating hard and soft beds, offer great facilities for the operation of any excavating force. The action of water would thus undermine the harder beds, leaving them to fall by their own weight, while the softer materials were removed. The manner in which this denudation was effected, and the period of its occurrence, have already been noticed; and by the same means we are able to account for this and other extensive lines of escarpment, where the succession of strata

* By means of the dam at Black-Rock, the water is taken from Lake Erie into the Erie canal, and carried through the Tonawanda creek, descending the terrace at Lockport by a cutting of less than thirty feet.

presents a very different structure and ability to endure abrasion. In the same way we are to account for the broad valleys in other situations, and the numerous gorges in the edge of this escarpment. These are of little extent, scarcely reaching beyond a quarter of a mile, and usually less; they present broad expanded openings on the north, and are very similar to the indentations upon lines of seacoast.

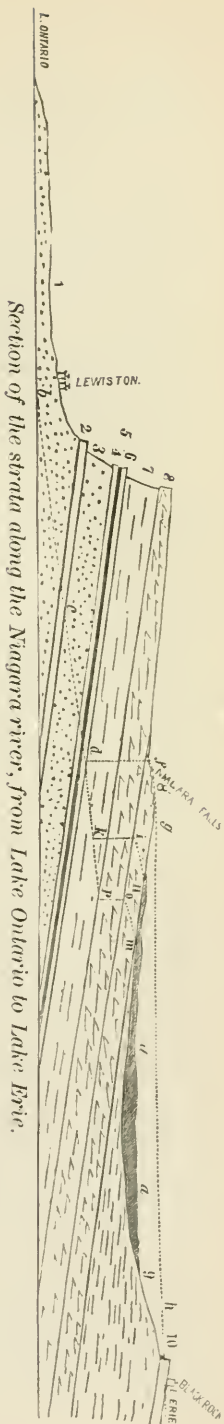
The strata 1, 2, 3, 4, 5, 6, 7 and 8, forming the escarpment at Lewiston as represented in the section, are those through which the gorge of the Niagara is excavated; all that portion above the dotted line *b, c, d*, as well as the depth of the river, being removed for a length of seven miles and a width of twelve hundred to two thousand feet. These rocks dip gradually to the south, and all below Nos. 6, 7 and 8 disappear beneath the level of the river before reaching the falls.

The limestone which forms the summit of the terrace at Lewiston, and which at its margin is not more than twenty feet thick, gradually increases from the addition of higher layers, till at the falls it has acquired a thickness of one hundred and sixty-four feet.* This limestone, about one mile south of the falls, disappears beneath the surface, and is succeeded by a soft marl of a bluish or greenish-grey color. This formation, which is the Onondaga salt group, occupies all the level country from two miles south of the falls, to Black-Rock, a distance of fifteen miles by the course of the river. To this succeeds the limestone terrace before described, on the north of Lake Erie.

The Onondaga salt group occupying this great breadth of country, and forming an important item in any calculation regarding the future recession of the falls, had never been noticed by any one till the publication of the annual reports of 1838. In all previous accounts the distance from the falls to Lake Erie was regarded as underlaid by limestone, and the limestone of Black-Rock was represented as resting upon the Niagara limestone.

The Niagara river, from Lake Erie to its emergence into the low country at Lewiston, has excavated a channel through the rocks represented in this section. The current, for the first two miles after leaving the lake, is very rapid; after which it flows on more gently, the channel gradually widening as far as Grand island, where it divides, the greater quantity of water flowing on the west side of this island. Farther down, the river expands to a width of two or three miles and presents all the appearance of a quiet lake, with small, low islands. The descent from Black-Rock to the head of the rapids is only fifteen feet. Approaching these rapids the river narrows and

*Eighty feet only are visible at the falls; its whole thickness was ascertained by levelling to Porter's quarry, a mile east of the river.



Section of the strata along the Niagara river, from Lake Ontario to Lake Erie.

EXPLANATION OF THE SECTION.

- | | |
|--|--|
| 1. Red shaly sandstone and marl, seen in the bank of the river at Lewiston, and extending to Lake Ontario. | <i>a, a.</i> A fluviatile deposit in the depression south of the rapids, probably similar to the fluviatile deposits of Goat island. |
| 2. Grey quartzose sandstone. | <i>b, c, d, f, g, h.</i> The dotted line represents the present surface of the river from Lewiston to Lake Erie. |
| 3. Red shaly sandstone like No. 1, with thin courses of sandstone near the top. | <i>d, f.</i> The perpendicular fall, over the Niagara limestone and shale. |
| 4. Grey and mottled sandstone, constituting, with those below, the Medina sandstone. | <i>f, g.</i> The rapids, fifty-two feet, over the upper thin-bedded portion of the Niagara limestone. |
| 5. A thin mass of green shale. | <i>c.</i> The whirlpool. |
| 6. Compact grey limestone, which with No. 5, constitutes the Clinton group at this place. | <i>k, i, n.</i> The position of the falls and rapids after a recession of one mile. |
| 7. Soft argillo-calcareous shale. Niagara shale. | <i>p, o, m.</i> The position of the falls and rapids after a recession of two miles. |
| 8. Limestone—compact and geodiferous. Niagara limestone. | |
| 8. The upper thin-bedded portions of the Niagara limestone. | |
| 9. Onondaga salt group, including the hydraulic limestone, or beds of passage to the next rock. | |
| 10. Onondaga and Corniferous limestones, being all the limestones of the Helderberg division which continue so far westward. | |

the current becomes more violent, and for about one mile before reaching the grand cascade, rushes on, with inconceivable velocity, over a declivity of fifty-two feet, to the edge of the chasm, where it is precipitated into a gulf one hundred and sixty feet below.*

The gorge through which the Niagara river now flows presents almost perpendicular walls, with a talus at the bottom, formed by the falling of some of the higher strata. The outlet of this chasm is scarcely wider than elsewhere along its course. In some places the channel is less than two hundred yards across, and again is expanded to twice that width. The breadth of the chasm at the top is nearly twice as great as that of the stream below. The declivity of the bed of the river, from the falls to Lewiston, is one hundred and four feet, or nearly fifteen feet in the mile.†

At one place, about a mile below the falls, and where the channel is narrowest, the stream glides with comparative stillness; while below this, where the channel is broader, it is driven along with great velocity. Again, below the whirlpool the surface of the river is more smooth, and the current more gentle, though the channel is narrower than above. These appearances, which have seemed inexplicable upon the common theory, and which have been used as arguments against the recession of the falls, have their cause in the geological structure of the place. Below the whirlpool there are no hard rocks in the bed of the river; consequently the channel is deeper, and the water is more quiet than where such rocks exist. At the whirlpool, and above that place, the hard sandstone No. 2 is at and near the level of the river, and consequently the channel is not worn so deep. Again, after this hard mass has dipped beneath the surface, the bed of the river is excavated in softer rocks; hence the narrow channel and smooth water a mile below the falls. Near the falls, the higher beds of sandstone, and the limestone of the Clinton group, approach the level of the river, and thus cause a wider, shallow channel, and more tumultuous water. Such I conceive to be the

* The birdseye view, facing page 67, conveys a very good impression of the face of the country, and the course of the river from Lake Erie to Lewiston. A representation of the course of the river by this method was given by Mr. Robert Bakewell, jr. and published in Loudon's Magazine of Natural History for March, 1830. This one was constructed without having Mr. Bakewell's view before me, and the artist finished his work without seeing it. The idea of thus representing it was doubtless original with Mr. Bakewell; but the same mode to a certain extent, was adopted by Father Hennepin in his sketch which is given in this chapter.

† A considerable declivity is required in the bed of such a stream, in order to give it power to remove obstacles which are constantly impeding its course. In any stream excavating its own channel, the declivity of its bed will be, in some degree, proportioned to the weight of the fallen masses which it has to remove; and if its channel be in soft shale, the descent will be very gradual, while the intercalation of harder strata increases the descent according to their proportion.

explanation of the variable width of the chasm, and the greater or less violence of the water.

In the course of this gorge, there is a single exception to the parallel sides and nearly vertical cliffs; this is upon the west bank of the river, at the whirlpool, as can be seen by referring to the plate. Standing upon the east bank of the river, it appears like a depression worn by the eddying current, which is partially obstructed in its course by the sandstone No. 2. Not having made particular examinations upon the Canada side of the river, I had overlooked the true cause of this indentation, till during the summer of 1841, while in company with Mr. Lyell, we examined this place, and found it to be an ancient gorge filled with drift, except a narrow ravine through which a small stream flows into the river. In the channel of this stream, near the river, there are one or two places where the rocks are exposed, proving this gorge to be less deeply excavated than that in which the Niagara now flows. The ravine may be traced for nearly two miles in a northwest direction, where it comes out to the general level of the surrounding country. From the point of its termination, and following the same direction for about one mile, we again commence descending through another deep gorge, which terminates upon the plateau at the base of the escarpment at St. Davids, four miles west of Queenston. It will be perceived by referring to the map, that the course of the river before coming to the whirlpool, if continued, would lead in the direction of St. Davids. From this fact it has been inferred that there is a continuous ancient gorge filled with drift, from the whirlpool to this place. This inference seems substantiated by facts; for upon the elevated ground just before commencing the descent to St. Davids, upon the estate of the late Governor Maitland, a well was dug to the depth of 150 or 160 feet, and the whole distance in gravel and sand. This proves at least that the limestone has been deeply excavated, and leaves no doubt in my mind of the continuity of this ancient gorge. This remarkable fact has been cited as an objection to the opinion that the Niagara formed its own channel; but still I hope to be able to show that its existence is equally an objection to the opinion that the gorge of the Niagara was produced by the action of the sea.

This ancient ravine appears to be filled with drift, of the period of the oldest drift of the district; consequently we infer that it was one of the earliest effects produced by that denuding agency which excavated all the great valleys of western New York. If this be true, it became filled with drift before we have any evidence of any part of this region being above the ocean, or of the Niagara river having an

existence; therefore, we have no ground for supposing that it was ever the channel of this or any other river. If, on the other hand, we assume that the present gorge of the Niagara was excavated by the ocean, and that the river has but cleared out the drift, then we are bound to show that it resembles other gorges, which there is every reason to believe that the ocean did excavate. The opening of the gorge at St. Davids, towards Lake Ontario, presents a width of two miles where no rock is to be found in the line of the escarpment; while that of the Niagara at Lewiston presents a width of 1,500, or, perhaps, 2,000 feet. Allowing this ancient gorge to be continuous as far as the whirlpool, we find it to have diminished to a width less than the present river channel. In this we see no analogy to the present channel of the Niagara, which, though variable in width, is scarcely wider at its opening on the north than in some other parts of its course. If we suppose that the undermining action of the ocean or an elevated lake aided in excavating this channel, then, also, we must suppose that it would at the same time have removed the drift from this ancient one; and if we suppose them both of the same age, or produced by the same cause, then we should expect to find them similar in character, which is not true. The existence of this ancient ravine, so different in character from the present channel, indicates a different origin; and as it corresponds with those gorges or indentations in coast lines, we infer that it was due to similar causes; while that of Niagara, corresponding with all modern river channels, or those which we know to have been formed by streams now flowing in them, we infer that it, too, had a similar origin.

It might appear more rational to conclude, that if the Niagara commenced excavating its own channel, it would more readily find a way through the drift filling this ancient gorge, than through a solid wall of rock; but this objection can be met by numerous examples, where old channels have been closed by modern accumulations, and the stream has excavated a new one through rocky strata. Such a case has already been illustrated in the passage of the Genesee from Portage to Mount Morris: in this example, the facts are incontrovertible; and whether the Genesee ever occupied the ancient valley which is now filled with drift, does not affect the conclusion; we see it leaving an ancient valley, through which it has flowed for many miles, and entering a narrow gorge in the rocks of Portage, making a circuit of two or three miles, when, by the ancient channel filled with sand and gravel, the same point would have been gained in less than half the distance. Similar examples may be found in Seneca and Cayuga lakes; the outlet of the former, instead of pursuing its course

through an ancient valley to Lake Ontario, turns to the eastward, and excavates a channel through the limestone and gypsum beds between that lake and Cayuga.

Numerous similar examples might be cited, were it necessary, in order to account for the fact that the Niagara did not take the course by the ancient ravine to St. Davids. In any case it only requires that the superficial deposit should be higher than the rocky strata, and that the water once be directed in that course, and it will wear itself a channel sooner than remove the other deposit.

In consideration of the argument that the channel of the Niagara has been worn by the action of the sea, it may be necessary to offer some analogous examples. In all ravines, or indentations, excavated in the face of sea cliffs, whether aided by a stream flowing in or not, we find a broad or trumpet-mouth opening toward the sea, and they recede abruptly to a termination. They never present a long, narrow ravine of equal width; and where of a length at all approaching that of Niagara, they have an opening many times broader than this at Lewiston. Numerous examples of ravines formed in this manner might be mentioned, but none of these resemble Niagara. In such instances they are broad enough to allow the stream to flow in the bottom, leaving waterworn materials along the sides, monuments of the abrading action of the waves. In the Niagara chasm there are no boulders, pebbles or gravel. The river occupies the whole width at the bottom, except a talus on either side, formed by angular fragments fallen from above.

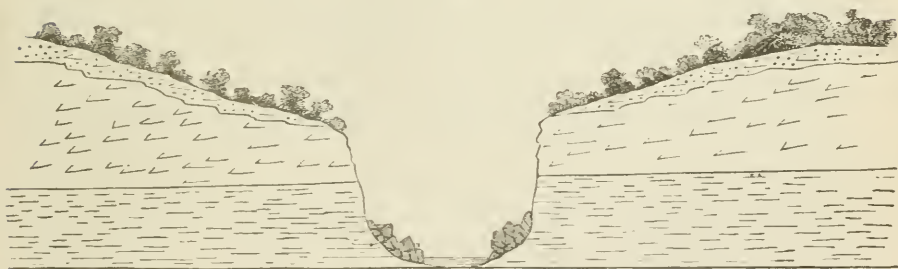
The valley of the Genesee, from Rochester to Dansville, offers a good example of a channel excavated by the action of the sea during the emergence of land; but this valley is broad, and partially filled with drift; and sides sloping gradually, and, for the most part, deeply covered with transported materials.

The small amount of wearing, or the recession of a fall accomplished by a stream during the period of our observation, might incline us to doubt the possibility of any body of water having excavated its channel backwards for a length of seven miles, and to a depth of from three to five hundred feet. But if the period of one life be sufficient to admit of observation proving the *smallest amount of recession*, then it is only requisite that we should carry on the process for an indefinite period, to accomplish the utmost that we require; or that we extend backward our imagination regarding time, in order to demonstrate what is already accomplished. Now it is proved that within the recorded observations of persons residing in the vicinity of Niagara, that the falls have receded within their recollection.

Therefore, if we are able to prove that this ravine could not have been excavated by the sea, during the emergence of the land, we have only this mode of operation left to account for its formation.

It is barely possible that there may have been a fissure in the present course of this river, which gave the first direction to the stream; but I have not been able to find any farther evidence than what has already been given on this subject. I have remarked that the surface of the limestone declines to the eastward, and I have been informed by Mr. Roy that it also declines to the westward from Queenston. Such being the case, it is possible there may have been a rent in this situation previous to the period when the river began to flow in that direction. From all that appears along the present river course, there was probably an ancient shallow valley extending in the direction of the present Niagara, which gave the first direction to the waters. This will be made apparent by the following transverse section of the river valley, which shows that the present square cut gorge is in the bottom of a previously formed valley. Along the whole course of the river this gradual ascent from the edge of the gorge is manifest, and together with other circumstances, is evidently of the origin we infer.

187.



From analogous facts, which have before been stated, we learn that it only requires an elevation of drift or other superficial deposits greater than the rocky strata, in order to give the water this direction, and cause it to excavate a new channel. In the present case it only requires the depression before noticed, whether in the superficial deposit or in the rock, to give the river that course; and, when it had once commenced flowing, no power would divert it. Even if we suppose the channel to have been previously in any other direction, if it became obstructed, the water would seek the lowest point along the terrace. In the present instance this appears to have been in the direction of Lewiston, and here the water commenced its work of excavation, cutting down the higher strata, and rapidly undermining

and removing those below. It is only necessary to refer to the accompanying section, in order to discover what materials the river had to work upon at this period.

It is impossible that there could ever have been a perpendicular fall of the whole height of the cliff at Lewiston, for the limestone at the top, being so much thinner than at the present falls, would soon be broken down by the pressure of the immense body of water precipitated over its edge upon the shale below. It may even be doubted whether the shale would be excavated fast enough to form a perpendicular fall, and it is probable that the water would be projected over a declivity of the upper shale (No. 7), to the limestone below, which, together with the higher layers of the sandstone, would form the crest of a second fall. From this, again, the water would be precipitated as far as the sandstone (No. 2), where a third fall would be formed. Thus, instead of a single fall of 350 feet, we should have the whole height divided into three falls, at some distance from each other. In consequence of the thinness of the upper limestone, that fall would recede faster than either of those below it; and the middle faster than the lower one. Even under these circumstances, the wearing action would go on much faster than at present. Finally, however, the recession would become less and less rapid, from the thickness of the limestone above; and from this cause, the two lower falls having only the same resistance to overcome as at first, would gradually approach the upper, till the whole become one.

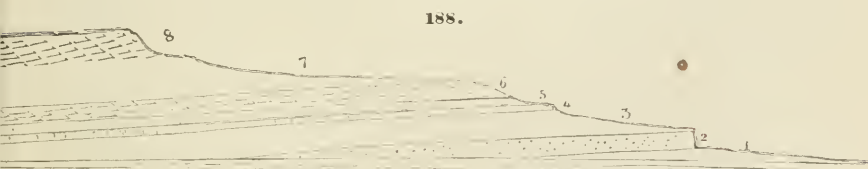
At the same time there are other circumstances to be taken into consideration, and among the most important of these are the dip of the strata and the ascent of the bed of the stream; both together tending to bring the strata down to the level of the water as we progress southward. This fact has also an important bearing upon the rate of recession; for while a hard mass remains at a considerable height above water, with a soft one below, the excavation of the softer one and undermining of the upper hard one, tends to the recession much more rapidly than if the whole were of uniform character. Thus it must have been that the fall over the sandstone (No. 2), receded much more rapidly while there was a considerable thickness of shale below, than when it approached the level of the water. This would happen after the falls had retreated about three miles, or nearly to the whirlpool. At this point the recession would go on very slowly for a long period; for this hard mass, being at the level of the water would effectually suspend the undermining process. Even at the present time this rock may be seen stretching into the river, from either side, beyond the others, and at the point where it crosses, producing a descent of eight or ten feet within a few rods.

After this long and almost stationary period at the whirlpool, the recession would again go on more rapidly; soft materials being presented at the river level to be excavated by the force of the falling water, which would thus undermine the harder mass above.

When the cascade had receded to near its present position, another pause, similar to that at the whirlpool, would occur, from the approach of the higher layers of sandstone (No. 4), and the hard limestone (No. 6), to the surface of the water. There are various proofs of this halting, both in the form of the chasm below the present fall, and from the fact that the higher layers of sandstone still remain in place; for it is seen that having passed a few feet beneath the water at the cascade, it supports the large fragments of the upper limestone which have fallen down.

The conclusion then, seems inevitable, that the river has been the great agent in excavating its own channel, from near the escarpment between Lewiston and Queenston, to the present position of the cataract; that the recession has been aided by the character of the rocks, presenting alternate hard and soft strata; and that the descent was overcome, not by one perpendicular fall, but by several. In support of this latter assertion, a single analogous case will furnish stronger evidence than a long argument. The course of the Oak Orchard creek, in Orleans county, is over the same strata, and exhibits the succession of falls and rapids, precisely in the manner I have just enumerated. The quantity of water, however, in this stream, is too small to produce anything like a degree of recession to compare with the Niagara river.

The following diagram will explain these remarks by showing the present position of the falls and rapids along the stream; the numbering corresponds to that upon the Niagara section, 186.



Section along the Oak-orchard creek.

1. Lower part of Medina sandstone. 2. Quartzose sandstone. 3. Alternating, shaly and hard sandstone. 4. Greyband; termination of the Medina sandstone.
5. Green shale of Clinton group. 6. Limestone of Clinton group. 7. Niagara shale. 8. Niagara limestone; falls at Shelby.

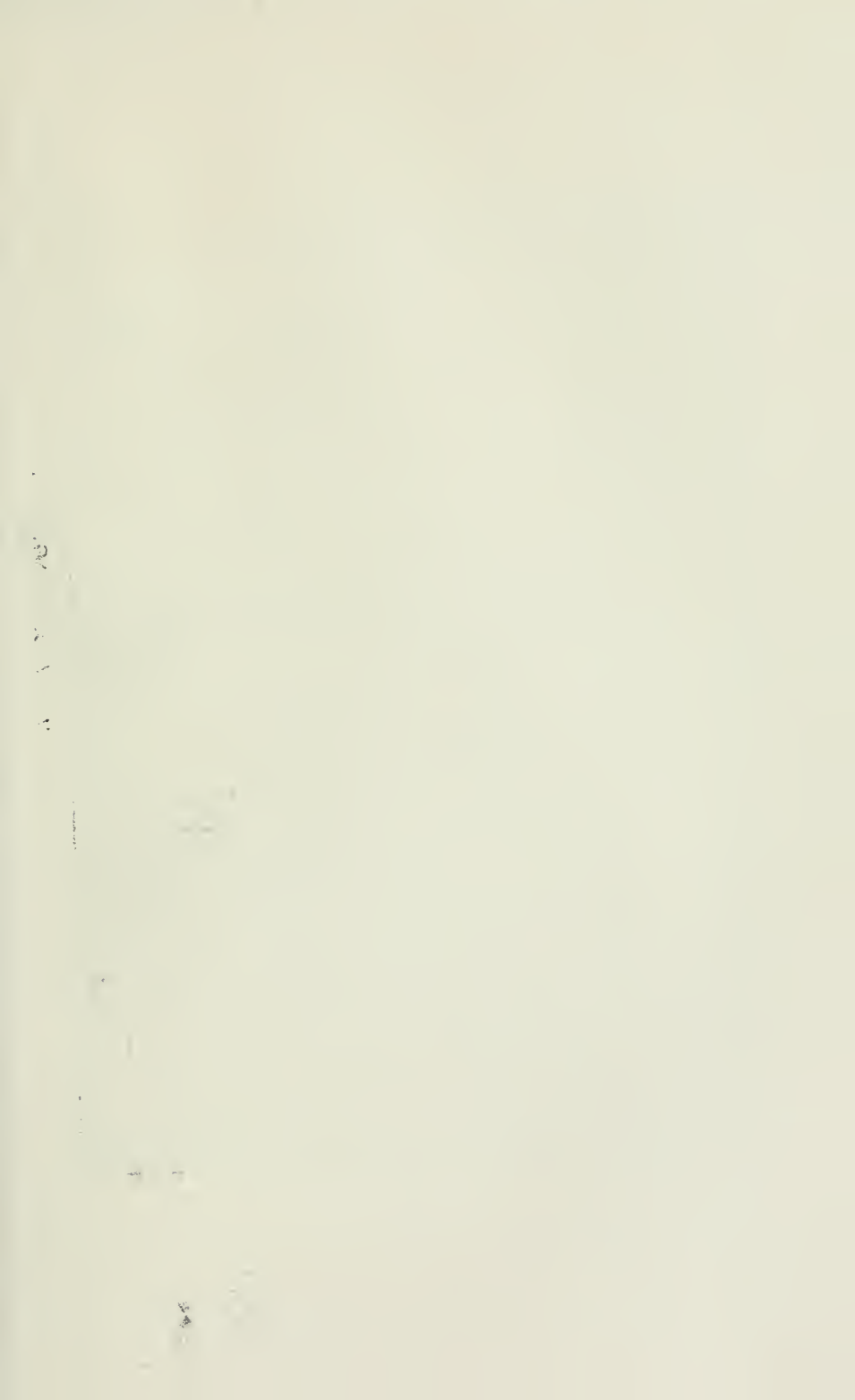
The same views have already been explained and illustrated, in relation to the falls on Genesee river; but the quartzose sandstone

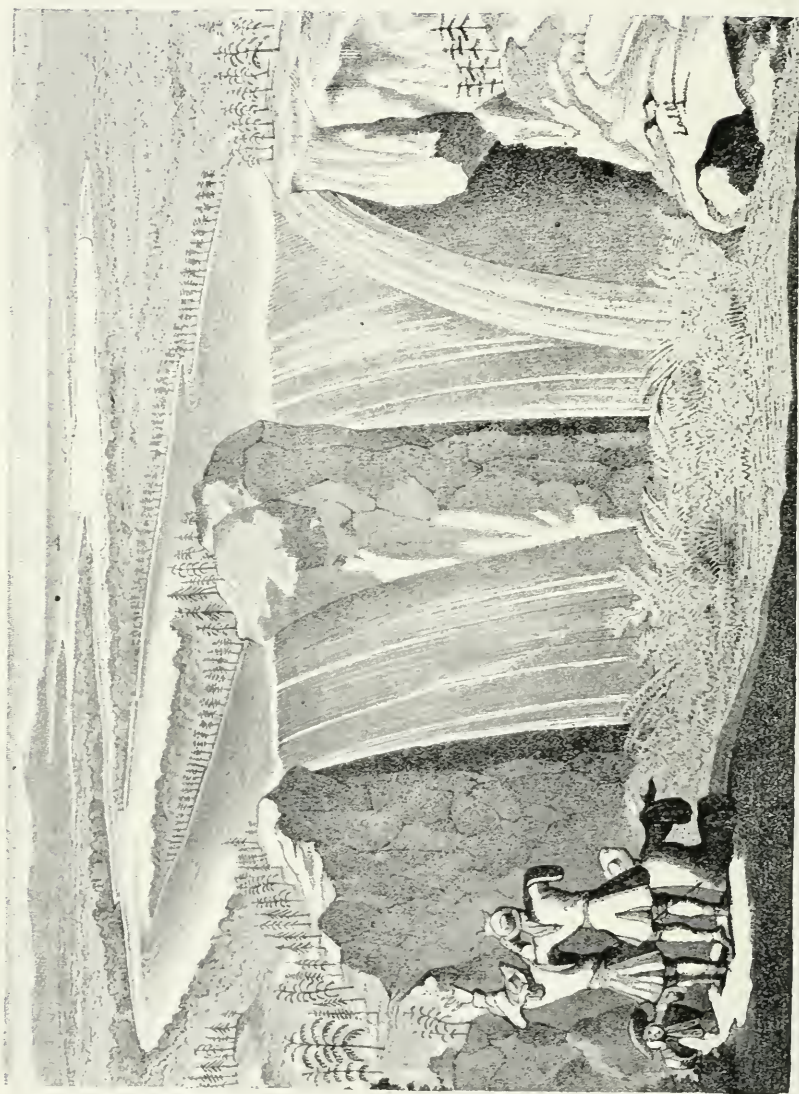
(No. 2) of the Niagara section does not extend so far eastward, and, therefore, it forms no item in the calculation at that place. The hard limestone layer (No. 6), or one filling the place of that at Niagara, has retreated a quarter of a mile farther up the river, where it forms a fall of twenty-five feet. This recession of the limestone, beyond the sandstone, is owing to a mass of green shale below it, twenty-three feet thick, while at Niagara the same shale is but four feet thick. From this place to the upper fall, about a mile and a half distant, we have a rapid stream. This fall is 110 feet high, and over precisely the same rocks as the Niagara fall at present, viz.: Nos. 7 and 8 of section, the Niagara shale and limestone. The limestone at the top of the fall is much thinner than that at Niagara, in consequence of the less recession into the mass, as well as from being thinner as a whole. We have here a case precisely analogous to Niagara, as I have supposed its former condition.

Had the quantity of water flowing down the Genesee been equal to the Niagara, the upper fall would have been excavated farther backward, and the lower fall, in all probability, entirely obliterated, presenting a rapid current from the upper fall to the present site of the Rochester landing. There appears here positive proof that there never has been so large a body of water passing down the Genesee as down the Niagara, and the concurring testimony is to the effect that the wearing action has been far less. The recession of the lower falls at Rochester would add little or nothing to the height of the upper; for the ascent of the river bed, and the dip of the strata, would cause the disappearance of the whole beneath the water, before reaching that point.

In support of the hypothesis that falls do retrograde, we may adduce sufficient evidence. Observations, during the last five years, upon the waterfalls of western New York, have furnished positive evidence of their recession. Among these may be noticed the falls on Jacock's run, near Geneseo, and Fall brook, a few miles farther south, both of which have evidently receded, from the undermining of the platform over which the water is precipitated. The amount during this time is very small, but quite sufficient to be appreciated.

Lateral streams flowing into ravines or river courses, furnish the most palpable evidence of the excavating power of water. The channel of Wolf creek, which comes into the Genesee through a perpendicular wall of rock, is a good example of this kind, where the evidence is conclusive that the excavating power is alone due to the stream. The junction of a small stream with the Genesee, on the west side, below Rochester, furnishes another example of this power.





A FAC-SIMILE OF A VIEW OF NIAGARA FALLS.

BY FATHER LOUIS HENNEPIN, 1698.

This stream has cut its channel through soft shale for fifty feet or more, a bed of limestone eighteen feet thick, a bed of shale of equal thickness, and below this another bed of limestone nearly equal to the upper one. Many more examples of a similar kind might be named, on the Seneca and Cayuga lakes, and their valleys continued to the south.

All the historical evidence that we possess upon the subject proves the falls to have receded; and, although there have been no monuments established, yet the representations of early travelers, when compared with the present condition of the falls, proves that a change has taken place, though we can not be certain of its precise amount.

The oldest authentic historical account of the falls which I have seen is that of Father Louis Hennepin, who traveled through this country in 1678.* The accompanying view of the falls is a fac simile of that published in his travels, and though rude and fanciful, it is, in many points of view, highly interesting and important.

It represents a projecting rock upon the west side of the river, which turned a part of the water across the main fall, as seen in the sketch. This fact is of great interest as showing one important change which has taken place within the historical era; for in regard to a portion of the water being projected from west to east, forming a cross fall, there seems no doubt, as it is particularly described. In chapter LXX he says, "From the end, then, of this island, it is that these two great falls of water, as also the third, but now mentioned, throw themselves, after a most surprising manner, down into a dreadful gulph six hundred foot and more in depth. I have already said that the waters which discharge themselves at the cascade to the east, fall with lesser force; whereas those to the west tumble all at once, making two cascades; one moderate, the other violent and strong, which at last make a kind of crochet or square figure, falling from south to north and west to east." The northwestern end of Goat island is also represented as extending perpendicularly to the water; and though we can hardly credit this, we can conceive how such an error may have been committed, when the spot was inaccessible.

In 1750, Kalm, a Danish naturalist, visited the falls, and his

*This work is entitled "A New Discovery of a Vast Country in America, extending above four thousand miles, between New France and New Mexico; with a description of the Great Lakes, Cataracts, Rivers, Plants and Animals: also the Manners, Customs and Languages of the several Native Indians; and the advantages of commerce with these different nations, &c." Dedicated to His Most Excellent Majesty, William III. King of Great Britain, &c. By F. Louis Hennepin. London, 1698. This work was first, published in Utrecht in 1697.

My attention was called to this book and view of Niagara falls by JOSEPH W. INGRAHAM of Boston, who has given much attention to collecting historical accounts of Niagara falls.

description and view is published in the Gentleman's Magazine in 1751. His general description corresponds with that of Father Hennepin, though there was at that time no third cascade. The period of his visit was seventy-two years after that of F. Hennepin, and he distinctly alludes to the projecting rock, which forced the water out of its direct course, causing it to fall across the great fall. He speaks of this rock having fallen down a few years previous, and in his view of the falls the spot is indicated. In this interval of seventy years we find that the recorded observations of these two travelers prove precisely the same kind of change to have taken place, as we suppose to have occurred previously, and which has subsequently altered the outline and position of the falls.

We have not space here to introduce all the subsequent accounts of Niagara falls which have been published, neither would they furnish us with arguments bearing upon their recession.

In 1824,* Professor Eaton gave a section of the rocks from Lewiston to Lake Erie, which, with the omission of the Onondaga salt group, corresponds with subsequent observations. This is the first account of the falls which I have seen where the geological structure of the place is given.

In the 28th Vol. of the American Journal of Science and Arts, Prof. H. D. Rogers has given a very full description of the falls, and the geology of the surrounding country, together with his views regarding the formation of the chasm of the Niagara, and the future recession of the cataract.

Mr. Hayes, in his paper on the geology and topography of western New York,† has presented many interesting facts and speculations relating to the falls and production of this chasm, as well as the fluvial deposit of Goat island and the eastern shore.

We have now to consider another class of phenomena, which aid us in our conclusions regarding the recession of Niagara, proving at least that water has extended much farther in the direction of Lewiston before the present gorge was excavated. The nature of this evidence I pointed out in my report on the Fourth Geological District of New York, in 1838, pages 271, 272, and 273. At that time, I was not aware that the same phenomena had before been noticed, though I have since learned that the existence of freshwater deposits on Goat island was known some years previous. Whether the important inference had been deduced from this fact or not, I do not know.

* Geological and Agricultural Survey of the District adjoining the Erie Canal, Part I, page 149.

† Am. Jour. Science and Arts, Vol. XXXV, No. 1.

Goat island stands upon the top of the precipice separating the two falls; it is formed by the accumulation of gravel, sand, and clay, upon the surface of the limestone, and is evidently a portion of a once much more extensive deposit. Upon the southern side of this island, where there is an escarpment, the thickness of the superficial deposit is about twenty-five feet. The upper half consists of coarse gravel and sand, with abundance of fresh water shells of the genera *Unio*, *Cyclas*, *Limnea*, *Planorbis*, *Valvata* and *Melania*; the same, both in genera and species, as those now inhabiting the river and lakes. The occurrence of these shells, in this situation, about forty feet higher than the top of the fall, proves the existence of a river or lake at an elevation sufficient to allow of such a deposition, for this accumulation of shells and gravel bears all the evidence of a fluvial deposit. It is equally evident that this deposit could not have been made while the falls were in their present position.

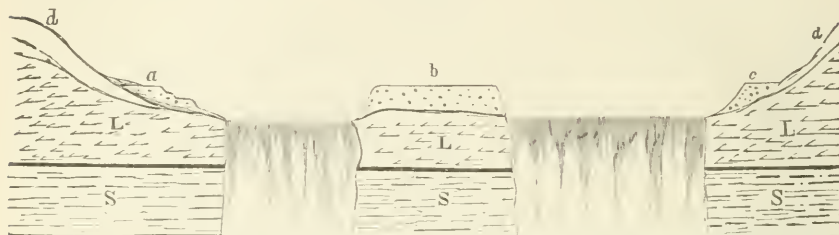
During a reëxamination of this place in 1841, in company with Mr. Lyell, we discovered the *Cyclas*, *Valvata*, etc., in a terrace, upon the east side of the river, of the same elevation as Goat island. It was at this place, and in the same deposit, that a *Mastodon's* tooth was found eleven feet below the surface. Farther northward, and more than half a mile north of Goat island, in another excavation, we discovered similar shells. At the same time we noticed the continuation of this terrace as far as the whirlpool. Since that time I have leveled the whole distance from the falls to the whirlpool, and find the elevations at the two places to correspond. Shells are even more abundant in this terrace at the whirlpool than at the falls. Farther north than this point, I have made no examinations for freshwater shells.

Upon the west side of the river there is a similar terrace, which is mentioned by Mr. Hayes as also containing freshwater shells,* in common with that on the east side. Now, in order to find a barrier on the north sufficient to elevate the water so as to make this deposit, it would require to extend it far towards Lewiston. Furthermore, it is evident that the deposits forming these banks or terraces, on either side of the river, and that of Goat island, were not made in this form, but are parts of a once much more extensive formation, which has been removed by the waters of the river. During the time of its deposition the river must have occupied this ancient valley, which extended toward Lewiston, finding a barrier much nearer the edge of the terrace than the whirlpool. In the bed of this expanded river or lake, much as it now is above the rapids, this deposit was

* *Am. Journal of Science and Arts*, Vol. XXXV. No. 1.

made, probably covering the whole extent. From the subsequent recession and drainage, the margins only have remained, together with Goat island, indicating its former extent. The position of this fluviatile deposit, which is subsequent to the ancient drift, may be illustrated in the following diagram:

189.



a. The terrace with shells on the eastern side.
b. Goat island.

c. The terrace on the Canada side.
d. The ancient drift.

L. Limestone. S. Shale.

From the present position of the remains of this deposit, there can be no doubt but it was once continuous, the greater part of it having subsequently been removed. The mode of its formation can be well illustrated by referring to fig. 186, *a, a*, which is intended to represent what is now going on in the broad expansion of the river above the rapids. This fluviatile deposit is made by materials brought down by the current, and doubtless mingled with a large accumulation of shells of *Unio*, *Melania*, *Anculotus*, &c., as these shells are abundant above the falls, and large numbers of the shells of *Uniones* are constantly brought down the rapids during the summer season.

The single terrace containing shells is not the only one; on the eastern side, at lower elevations, there are in succession three others (as seen by the accompanying topographical map of the falls), which seem to be remains of the deposit in the river bed, as it successively excavated its barrier on the north, and receded towards its present position. For the greater part of the distance from the falls to Black Rock, on the eastern side there is a terrace or bank a few feet higher than the river, which may have originally limited its waters when it stood at the level indicated by the freshwater deposit of Goat island. Near Black Rock, and bordering the valley of the Tonawanda, there is a terrace some twenty feet higher, which appears to have been the boundary of the river or lake at a still earlier period; but with these we have, at present, nothing to do. The existence of the fluviatile deposit of Goat island, and at the same level on the eastern side of the river, requires for its elucidation the existence of water standing at a level somewhat higher, in order to allow of the

deposit being made in the bed of the stream. To accomplish this, a barrier is required further north than the whirlpool, and about the height of the surface of limestone between this and Lewiston. The occurrence of successive terraces below this one, proves that the drainage to the present point was not effected suddenly.

There is another fact which should be noticed, as proving the existence of a current from south to north, during the deposition of the materials forming Goat island. The pebbles, at least large numbers of them, are of the limestone of Black Rock, and the harder layers of the Onondaga salt group, like the rock in place at the upper end of Grand island. The surface of the rock, on which the deposit forming Goat island is made, is smoothed and scratched, as are the surrounding surfaces, both in the rapids and on either bank of the river. The deposit is of greatest thickness toward the fall, and thins entirely out at its southeastern extremity. In some places the lowest part of this deposit is of clay, which has been subsequently covered by gravel and sand, containing the freshwater shells. This proves the first condition to have been that of a quiet lake, while subsequently a current, transporting pebbles and sand, passed over the same bed, leaving the coarse deposit.

There is another indentation on the eastern bank of the Niagara, below the whirlpool. This has been cited as a case where the small stream coming in, is insufficient to account for such an excavation.* It occurs at the junction of Bloody run and the river, and bears the strongest evidence of having been produced by the common agents, frost and water. The wearing action of the stream alone is probably insufficient to produce this short ravine, which extends a few rods back from the margin of the river bank; but when we take into consideration the fact, that the water penetrates all the fissures of the rock, and then during fall and winter, expands by freezing, we shall find means of explaining the mode of operation. At the falls, the recession is by undermining and breaking down of the upper masses; the action of frost is not to be taken into consideration, as the water, probably, never freezes in the fissures behind the fall. Now I consider it as an established fact, that small streams, which freeze during winter, will excavate their beds more rapidly in proportion than large bodies of water which never freeze. It appears to me that the indentation at Bloody run is not greater than might be expected to have taken place while the main channel receded to its present position.

Whatever facts and arguments may be advanced to prove the existence of phenomena indicating the former action of the sea in

* *Am. Journal of Science*, Vol. XXXV. No. 1.

excavating the Niagara channel, and whatever objections may be advanced for or against other theories, I am fully convinced, from the facts presented, that the existence of the falls and the Niagara river, in their present position, is of very recent date geologically.

We come now to consider the future recession of the Niagara falls, and its consequences. This is a subject on which many speculations have been hazarded, but no one appears to have undertaken the calculation with a full knowledge of the geology of the district, or to have taken into account the many disturbing influences. At the present time, the cliff over which the water is precipitated, is nearly equally divided between thick-bedded limestone and soft disintegrating shale. It is by the action of the spray from the falling water upon the shale undermining and leaving the limestone unsupported, which falls down by its own weight, that the falls recede from their present position. Now if we believe the statements of those who have resided at the falls, the recession has been about fifty yards within the last forty years; but from all the data I have been able to obtain, this appears to be much too great an estimate; indeed, it is extremely questionable if the fall has receded as many feet within that time. The central portion of the Horseshoe fall recedes more rapidly than any other part, for here the greatest force of the river is exerted. We know, likewise, from the testimony of all residents at this place, that the American fall is becoming more curved in its outline, whereas formerly it was nearly in a straight line. The successive descent of large masses of limestone, and the still continued overhanging of the table rock, prove very conclusively the unremitting action of water and air upon the shale below.

In the absence of established landmarks, we are compelled to leave the rate of recession unsettled for the present. The accompanying trigonometrical map of the falls will furnish the means of doing this, by the monuments which have been established, and which may be considered as permanent points of reference for the future.

Leaving out of view the time or rate of recession, we have sufficient data to establish with certainty the future changes which will supervene, allowing the recession to go on as it is now doing. The lower half of the rock at the cascade, or about eighty feet, is of soft shale, the limestone above being of equal thickness; higher still is about sixty feet of thin-bedded limestone, forming the rapids. These different rocks are represented in the section as 7, 8 and 8', respectively. Now these beds dip to the south at the rate of about twenty-five feet in the mile, and the declivity of the bed of the river is about fifteen feet in the mile from the falls to Lewiston. It follows, there-

fore, that as the falls recede, there will be a less amount of shale above water, owing to the dip; and to this must be added the amount of declivity in the river bed, both together making forty feet. So that when the fall has receded one mile, the surface of the water will stand at k , of section 186, or a point in the shale half way between the present surface of the water and the bottom of the limestone. Going on at this rate for another mile would take away from the fall forty feet more of the shale, so that the surface of the river would then stand at p , or the base of the limestone.

The cataract would then have a solid wall of limestone to wear down, the river beneath protecting, in a great measure, the undermining action upon the shale. During this time, and at the end of the first mile, the falls would have arrived at the present site of the commencement of the rapids, and thus about sixty feet more of limestone would be added to the height; unless from its thin-bedded character it continued to recede faster, and thus remain a rapid. In this case, there would be a fall of 140 feet at the end of the first mile (i, k); and one of 100 feet (o, p) at the end of the second mile.

At this period, then, we are to contemplate the cataract of Niagara as having receded two miles, the shale having disappeared beneath the river, and the cascade presenting a solid wall of limestone 100 feet high, and a rapid of forty or fifty feet (o, m) beyond. The recession will then go on very gradually; and so soon as masses from this cliff have fallen down to fill up the river bed, as they inevitably will in a great measure, then the base will be protected so effectually that little influence will be exerted by the force of the water. Eventually, however, the cliff will be broken down, and huge fragments piled up below, until the cataract will be nearly lost amid them. This state of things will continue for a long time, the height gradually diminishing, till the river has cut its way back for two miles further, when there will be no thick-bedded limestone above water, and the higher beds will form a rapid as before.

This point of meeting between the surface of the river below the fall and the top of the thick-bedded limestone, will be about one hundred feet lower than the top of the present cascade; and as there will be forty feet of rapids in the thin-bedded limestone within a short space, as there now is, it follows that there will be added to the descent of the river beyond the rapids, one hundred feet more than at present, as the surface of the limestone has dipped to that amount. The whole fall in the river at that time, from Lake Erie to the point of junction between the limestone and water below the rapids (h, o), will be about one hundred and sixty feet. The distance between this

point and the outlet of Lake Erie is occupied by nearly uniform soft layers; and after a partial wearing down of the limestone forming the rapids, the descent will be equally distributed over the whole extent of sixteen miles, giving a uniform declivity of about ten feet in the mile, or one-third less than the present declivity in the bed of the river from the falls to Lewiston. From the nature of the bed of the river for sixteen miles below Lake Erie, it may be doubted whether this rapid descent along the whole distance would be continued; for the stream, having no heavy blocks of rock to remove, would keep its channel clear with a far less declivity; and should this prove the case here, we might still have a fall of a few feet, at the outlet of Lake Erie, over the limestone succeeding the salt group.

Whether such a fall would occur, depends upon the solution of the problem regarding the required declivity in the bed of the river below Lake Erie. Whichever way it may occur, it will make no material difference in the great result, which will be either a continuous rapid stream from Lake Erie to Lewiston, or a rapid stream with a low fall at the outlet of Erie. If present causes continue to operate as now, such will be the consummation of the grand cataract of Niagara.

It is unnecessary here to follow on this recession gradually from the outlet of Lake Erie to the final drainage of a portion of its waters. The views which have been entertained of the sudden drainage of this or any of the upper lakes, and a deluging of the country on the north and east are no longer considered as tenable by any one; and even if Lake Erie could be drained suddenly, it would cause no deluge of any importance. If the whole lake were at once placed upon Lake Ontario, it would only elevate its surface by about one hundred and fifty feet, so that its extent would not exceed the limits of the ancient lake ridge, and the outlet would still be the valley of the St. Lawrence.

Thus far the country supplying the water to the upper lakes has been but little changed by the hand of cultivation; the primeval forests still clothe the surface, and evaporation, to a great extent, is prevented. This can not always remain so; the advancing settlements will yet penetrate even to the wilderness bordering Lake Superior, and the opening of the surface to the influence of the sun's rays will greatly diminish the supply of water flowing into its tributaries. These causes will sensibly diminish the quantity passing down the natural outlet; and the mighty Niagara is destined to be, at certain seasons, but a diminutive representative of its former grandeur.

But this event, though a certain result of existing causes, must still be inconceivably distant; and Niagara, for thousands of years, will continue to be the *Thunder of Waters*, whose magnificence no pen can describe, no pencil can express; which to be appreciated must be seen in its vast tumultuous waves, as they sweep down the rapids and are hurled into the immense chasm below, and heard in its voice of thunder, which drowns all other voices, and reverberates in one perpetual roar of sound and echo.

NOTE.—The quantity of water flowing down the Niagara river has been variously estimated by different observers.

	Cubic feet per minute.
Mr. Dwight estimates the amount at	361,392,742
Mr. Darby	27,878,400
Mr. Pickens	3,087,533
Mr. Barrett.....	<u>19,500,000</u>

The last estimate is from three different observations made at Black Rock during the high water of 1838 and 1839. The extremes of all the observations did not vary more than 20,000 feet per minute.

Mr. Barrett informs me that the quantity of water taken out by the different canals is as follows:

Erie canal, 30,000 feet per minute.

Welland canal,* 7,000 cubic feet per minute.

Illinois canal, from 5,000 to 10,000 cubic feet per minute.

In addition to this estimate, there is a considerable waste of water along these canals, which is not taken into account. All these amounts are small when compared with the great body of water flowing into this channel, and we can scarcely suppose that this abstraction will produce any appreciable difference in the rate of recession; but there are other causes which will certainly produce an important diminution.

TRIGONOMETRICAL SURVEY AND MAP OF NIAGARA FALLS.

The accompanying map has been constructed from a very careful survey by Mr. Blackwell,† giving the present position and outline of both falls, and the river banks upon either side. Upon application to his excellency Sir Charles Bagot, late Governor-General of Canada, I was authorized to establish monuments upon the Canada shore, and was also kindly offered every other aid to promote the objects of the survey. These monuments, together with those in New York, will enable future observers to ascertain the amount of recession during

* This amount will be greatly increased by the enlargement of this canal.

† This survey was made in the fall of 1842, though the observations had been principally made by Mr. Blackwell in 1841; but as no permanent monuments had been established, it was thought better to review the whole. Through the kindness of Mr. Fay, the resident engineer at Lockport, Mr. Gibson and Mr. T. Evershed were directed to accompany me, and, together with Mr. Blackwell, to make the requisite observations and run the levels, all of which are shown on the map.

any given period. In places where the rock is exposed, copper bolts have been fixed, and in other places hewn stone monuments. The starting point for all these observations is a copper bolt fixed in the rock on the north side, near the edge of the American fall; the trigonometrical point No. 1, is thirty-nine feet four inches north, 80° east from this. These points are connected with T. P. No. 2, so so that in the event of those nearest the cliff being undermined, the latter can be resorted to. The accompanying table of observations will serve to reconstruct the map so long as any of the points remain.

The following are some of the elevations noted at the time of this survey:

	Feet.
Height of American falls, October 4, 1842	167.70*
Height of Canada or Horseshoe fall.....	158.50
First terrace, height above top of fall at the point before mentioned.....	14.75
(The surface of this terrace is uneven, with scattered fragments of limestone, appearing like the bed of a river.)	
Second terrace	24.09
Third terrace.....	32.42
Fourth terrace (the one containing shells).....	39.79
This terrace slopes upward to the railroad, a height of	46.20
General level of Goat island, corresponding to that of the fourth terrace.....	39.86
Top of highest terrace at whirlpool.....	70.00
Base of this terrace, or level of the bank at the same place.....	46.98
Shells were found in a fine clayey loam at the whirlpool, at an elevation of	33.03
More abundant at.....	35.00
And continuing upward to.....	46.00

It will be seen that the elevation of the point where these shells occur at the whirlpool corresponds with Goat island and the fourth terrace on the east bank of the river. This can leave no doubt that these points are portions of a once continuous deposit, and it is not improbable that it may be traced still farther to the north. It will be recollected that the tooth of a mastodon, and shells of *Cyclas* and *Valvata*, were dug from the fourth terrace, eleven feet below the surface, or about four feet lower than those seen at the whirlpool, though these may have extended as low. In the terrace at the falls, these shells have not been found at an elevation so great by about six feet as at the whirlpool.

* This elevation is from the level of the water below the falls to the copper bolt near T. P. No. 1. The elevation varies from four to twenty feet with the elevation of the water in the river below the falls.

TABLE OF OBSERVATIONS.

TRIGONOMET- RICAL POINTS.	Course.	Points of intersec- tion.	TRIGONOMET- RICAL POINTS.	Course.	Points of intersec- tion.	TRIGONOMET- RICAL POINTS.	Course.	Points of intersec- tion.
From No. 1.....	N 66° 35' E, 60 ft.	to No. 1	From No. 5.....	S 40° 36' W.....	to No. 31	From No. 7.....	S 61° 53' E.....	to No. 2
" " " " " "	N 86° 20' W.....	" 2	" " " " " "	S 37° 50' W.....	" 32	" " " " " "	S 56° 30' E.....	" 3
" " " " " "	N 70° 0' W.....	" 3	" " " " " "	S 49° 0' W.....	" 33	" " " " " "	S 52° 45' E.....	" 4
" " " " " "	N 33° 5' W.....	" 16	" " " " " "	S 65° 0' W.....	" 34	" " " " " "	S 49° 30' E.....	" 5
" " " " " "	N 19° 0' W.....	" 19	" " " " " "	S 72° 0' W.....	" 35	" " " " " "	S 48° 15' E.....	" 6
" " " " " "	N 11° 55' W.....	" 20	" " " " " "	S 88° 50' W.....	" 36	" " " " " "	S 46° 45' E.....	" 7
" " " " " "	N 8° 0' E.....	" 21	" " " " " "	S 80° 45' W.....	" 37	" " " " " "	S 44° 0' E.....	" 8
" " " " " "	N 15° 50' E.....	" 22	" " " " " "	S 70° 40' W.....	" 38	" " " " " "	S 43° 15' E.....	" 9
" " " " " "	N 16° 50' E.....	" 23	" " " " " "	S 63° 30' W.....	" 39	" " " " " "	S 39° 15' E.....	" 10
" " " " " "	N 25° 0' W.....	" 24	" " " " " "	S 51° 15' W.....	" 40	" " " " " "	S 38° 30' E.....	" 11
" " " " " "	N 46° 10' W.....	" 48	" " " " " "	S 37° 30' W.....	" 41	" " " " " "	S 37° 5' E.....	" 12
" " " " " "	N 67° 30' W.....	" 49	" " " " " "	S 27° 50' W.....	" 42	" " " " " "	S 33° 5' E.....	" 13
" " " " " "	N 73° 30' W.....	" 51	" " " " " "	S 17° 40' W.....	" 43	" " " " " "	S 33° 5' E.....	" 14
" " " " " "	N 85° 0' W.....	" 52	" " " " " "	S 8° 50' W.....	" 44	" " " " " "	S 33° 5' E.....	" 15
" " " " " "	N 31° 45' W.....	" 56	" " " " " "	S 70° 15' W.....	" 46	" " " " " "	S 27° 5' E.....	" 16
From No. 2.....	N 74° 45' W.....	" 16	" " " " " "	S 73° 30' W.....	" 53	From No. 8.....	S 74° 27' E.....	" 4
" " " " " "	N 41° 45' W.....	" 19	" " " " " "	S 54° 30' W.....	" 54	" " " " " "	S 80° 0' E.....	" 5
" " " " " "	N 38° 0' W.....	" 20	" " " " " "	S 59° 10' W.....	" 55	" " " " " "	S 81° 27' E.....	" 6
" " " " " "	N 40° 45' W.....	" 21	" " " " " "	S 68° 15' W.....	" 58	" " " " " "	S 82° 40' E.....	" 7
" " " " " "	N 14° 05' W.....	" 22	From No. 6.....	S 73° 0' W.....	" 29	" " " " " "	S 83° 27' E.....	" 8
" " " " " "	N 8° 40' W.....	" 23	" " " " " "	S 83° 30' W.....	" 30	" " " " " "	S 84° 40' E.....	" 9
" " " " " "	N 31° 30' W.....	" 24	" " " " " "	S 86° 0' W.....	" 31	" " " " " "	S 87° 0' E.....	" 10
" " " " " "	N 31° 30' W.....	" 48	" " " " " "	S 86° 0' W.....	" 32	" " " " " "	S 87° 0' E.....	" 11
" " " " " "	N 55° 30' W.....	" 49	" " " " " "	S 71° 15' W.....	" 33	" " " " " "	S 88° 50' E.....	" 12
" " " " " "	N 78° 30' W.....	" 50	" " " " " "	S 85° 0' W.....	" 34	" " " " " "	S 89° 45' E.....	" 13
" " " " " "	N 82° 0' W.....	" 51	" " " " " "	S 88° 30' W.....	" 35	" " " " " "	S 89° 45' E.....	" 14
" " " " " "	N 77° 45' W.....	" 52	" " " " " "	S 75° 20' W.....	" 36	" " " " " "	S 69° 15' E.....	" 15
From No. 4.....	N 42½ E, 100 ft.	" 17	" " " " " "	S 84° 0' W.....	" 37	" " " " " "	S 64° 55' E.....	" 25
" " " " " "	N 48° 30' E, 46 ft.	" 18	" " " " " "	S 83° 40' W.....	" 38	" " " " " "	S 30° 15' E.....	" 26
" " " " " "	N 70° 45' W.....	" 53	" " " " " "	S 77° 30' W.....	" 39	" " " " " "	S 25° 30' E.....	" 27
" " " " " "	N 85° 45' W.....	" 54	" " " " " "	S 63° 10' W.....	" 40	" " " " " "	S 85° 25' E.....	" 28
" " " " " "	N 88° 50' W.....	" 55	" " " " " "	S 47° 0' W.....	" 41	" " " " " "	S 85° 25' E.....	" 29
" " " " " "	N 6° 30' W.....	" 56	" " " " " "	S 45° 50' W.....	" 42	" " " " " "	S 68° 10' E.....	" 30
From No. 5.....	N 68° 45' W.....	" 28	" " " " " "	S 36° 15' W.....	" 43	" " " " " "	S 62° 40' E.....	" 31
" " " " " "	N 61° 15' W.....	" 29	" " " " " "	S 29° 15' W.....	" 44	" " " " " "	S 54° 50' E.....	" 32
" " " " " "	N 56° 30' W.....	" 30	" " " " " "	S 16° 45' W.....	" 45	" " " " " "	S 40° 10' E.....	" 33

Stone monuments set at trigonometrical points No. 1, 2, 5, 6 and 8, and one set N. 68° 10' W. 200 chains from T. P. No. 6. Copper bolts set at trigonometrical points No. 7 and 9, one set S. 67° 30' W. 72½ feet from T. P. No. 9, and one set S. 80° 30' W. 39½ feet from T. P. No. 1.

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v. 8

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C. 1



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